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TECHNIQUES AND PROBLEMS IN THE STUDY OF HUMAN COLOR PERCEPTION

VERNE F. RAY

CERTAIN critical questions relating to color vision can be answered definitively only through the use of anthropological data. Nevertheless anthropologists have left the field to the psychologists and physicists who have studied these phenomena for ninety years without being able to develop a single theory which is mutually acceptable. Physicists still hold to the Young-Helmholtz thesis, developed in 1860, and known as the tri-chromatic theory because it postulates three separate receptors, all in one retinal cone, for the selective registration of red, green, and violet. Psychologists and physiologists, on the other hand, subscribe to a four-color theory which has been phrased in as many different ways as there have been writers on the subject. Many of these phrasings have been evolutionary in character. Man is pictured as having passed through two or three evolutionary changes with vision developing from an all-gray or two-color stage to the four-color stage in some, but not all, of the human beings of today. I need only mention the term "blue-green confusion" in order to call to the minds of readers the effect that this theory has had on anthropology. Names prominently associated with variants of this position are Ladd-Franklin, MacDougall, Rivers, and Parsons. The theory is widely accepted today with Parsons as the leading spokesman.

But it is not my object here to analyze the weaknesses of current theories. Rather I wish to present a field technique by which anthropologists may gather data on human color perception with scientific precision so that an appropriate attack can be made on the basic problems of color perception. I shall also offer certain conclusions relating to these problems which have been arrived at as the result of analysis of a body of data gathered by such means.

The technique is not new in its basic features; it was used in obtaining data which I presented as part of an ethnographic report as early as 1932. I did not at that time describe or publicize the technique as such because it was still in the experimental stage. I nevertheless hoped that others would become interested in this tool and that we might soon have a satisfactorily accurate and objective procedure for the gathering of much needed data for the study of sensory patterns. But apparently I was quite wrong in assuming that technical or methodological procedures described in the course of an ethnographic presentation are thereby made known to the profession. Therefore what I present here are the results of my own experimentation which are less conclusive than would be the case if I could cite the findings of co-workers. During fifteen years of intermittent study I have recorded data from about three score tribes of western America from Alaska to Mexico. In addition, I have a small number of records for Western populations.

Anthropologists, generally, try to get some notion of the range and character of color patterns in the culture being studied and of color perception of the persons involved. Even though this is done in a haphazard way, it is often possible to get a fairly full list of color terms and to get some information on the manner in which the spectrum is divided into units. The data of one investigator are never comparable with those of another, however. This is due to a number of factors, the most important of which is the absence of an objective method of measurement and designation of the color values involved. My earliest attempts to correct this deficiency led me to experiment with spectroscopes of the familiar type. I found that these were impossible to use in the field because of informant reaction, a situation which I should have anticipated and which I need not describe here. Independent of this personal factor, however, another characteristic of the spectroscope makes it inapplicable to this type of work. Certain bands of color are relatively broad, others extremely narrow. The narrow bands do not provide sufficient gradation to cover the range of distinctions which many cultures designate by specific nomenclature. Some thought was given to the preparation of an elaborate spectrograph to provide large patches of color by transmitted light and to expand the narrow bands. This approach was reluctantly discarded when it became apparent that such an instrument would be cumbersome, expensive, and difficult to use in the field.

The value of a spectroscope or spectrograph is, of course, the fact that color values are accurately identified by wavelength. It can be categorically stated that there is no other scientifically satisfactory method of identifying color values. Attempts have been made to establish international color standards but these

have failed completely; the anthropologist could hardly have expected them to succeed. In the English language there are over fifty thousand color designation terms. Even with an artificial restriction of the number of terms to a dozen or so, no agreement can be obtained on the points and boundaries to be fixed. Therefore it was obvious that whatever the character of the color samples that I might use, identifications in terms of wavelength must be retained.

The most desirable type of color sample is that presented by a pigmented flat surface. It has generally been assumed, however, that spectrally accurate color rendition by this method is impossible. Experimentation has shown, on the contrary, that quite satisfactory results may be obtained for use in psychological and physiological experiments. The situation is quite different in physics where structure rather than perception is being studied and, consequently, minute variations in homogeneity of surface with resulting wavelength variation are not tolerable. In psychological experiments the variables which are inherent in the organism and its environment are sources of more serious errors than slight qualitative imperfections in the color samples used. Such factors include quality of light, the presence of reflections, and the reactions of the subject to the experimental situations. It may be stated in this connection that the use of dyed wools or fabrics as color samples, or indeed any three-dimensional material, introduces so many uncontrollable factors and cultural biases as to render the results wholly worthless. Apparently the tradition of using color wools has grown up simply because wool fiber absorbs dyes efficiently.

Theoretical and methodological considerations demand the use of series of tints and shades as well as of standard colors. This again tilts the scale in favor of use of pigments. It was therefore decided to take an experimental set of pigmented cards to the field in order to obtain answers to certain questions; e.g., how many series of tints and of shades are needed; and into how many steps need the spectrum within each of the series be divided. Nearly one hundred cards were used in the first work; these included two series each of tints and shades, and a small series of grays. It was soon determined that a single series of tints and one of shades are sufficient, and that a minimum of sixteen steps is needed in each. These conclusions were reached by applying the principle that the variants offered must result in some duplications of response so that one can be sure that the full range of visual color perception is being recorded as far as the linguistic repertory makes this possible. But unnecessary overlapping should be avoided.

Before going further, I must give attention to two questions of methodology. First, we are not concerned with color preferences, with individual (i.e., personal) variations, nor with the measurement of thresholds of recognition in color varia-

tion. These are psychological and physiological questions upon which we have quite full data; their study is properly left to specialists in the respective fields since no anthropological considerations are involved. As an item of information, it may be stated that a sophisticated subject of any nationality or race yet studied can arrange in serial order a number of color samples with a degree of subtlety that goes far beyond the classification provided by his culture. This is analogous to the ability of an auditor to characterize musical tones as higher or lower even though they are separated by but a few vibrations, whereas the notes he recognizes may be separated by hundreds of vibrations. Unsophisticated subjects often fail to see or hear any subcultural differences. This indicates the profound significance of human auditory and visual patterns in actual living. As anthropologists we are first concerned with pattern. This, in turn, may give us answers to questions about perception which could never be reached by psychological or physiological techniques.

Second, we must ask whether it is proper to use spectral colors and wavelength designations in the description of color systems which are seldom concerned with spectrally true chromas. Does not this system automatically eliminate many important colors such as the browns? A criticism of this sort is methodologically sound and there is no logically satisfactory answer to it. I can only say that experimentally a full series of spectral pigments, including tints and shades, does in fact cover exhaustively the color patterns of all peoples so far investigated. Perhaps the "impurity" of our best available pigments is responsible for qualities being present, particularly in the shades and the tints, which elicit all phases of color classifications, including so-called "off" colors, browns, and olives. There are two exceptions: the non-spectral violets and the grays. We can designate the former in terms of complements to spectral colors. At the extremes of the gray range we have the objective designations, white and black. Between these points are the neutral grays which can be designated in terms of position along the range. Grays mixed with color can be described in terms of the wavelength and amount of color introduced. I have not found a satisfactory method of indicating the amount of color in purely objective terms; however, a certain subjectivity of evaluation is much less serious here than in the color series. (Black, white, and neutral grays are called colors here because they are always a part of cultural color patterns.)

Returning now to the main discussion, a word is needed on the preparation of color samples. I have found that a competent artist, working with the best water-mixed pigments available, can match spectrum lines in the broad color bands with sufficient accuracy so that another artist given the same problem and

working on it independently will produce a pigment sample that is, for experimental purposes, indistinguishable from the first. In working on the colors with narrower spectral bands, it is best to allow the artist to produce several steps on either side of the central line with reference only to the latter, and then later to compare with the spectrum and discard unsatisfactory attempts.

My own work has been done, for the most part, with color cards obtained in a much simpler way. Early in my investigation I discovered that the Bradley Company at one time produced a series of standards and tints in which they used the best available pigments. From these a board of scientists and artists selected the ones spectrally most accurate and identified them in terms of wavelength at certain rather widely separated points. I have measured the wavelength at intermediate points in order to fill out the range. I do not know whether these commercially prepared cards are still available or not. In any event, it would be necessary to check them for wavelength and spectral accuracy before use because pigments commercially used are seldom or never held constant for any great length of time.

Comparative work may be facilitated if color units are designated in terms of boundaries rather than midpoints. If only the midpoint of each unit is designated, it is much more difficult to compare one's results with those of another worker whose color units are differently selected. Color names can be dispensed with entirely when wavelength designations are used. Thus the work of a Chinese anthropologist, for example, can be used alongside that of an English writer. However, for purposes of writing and discussion it is desirable to have a minimum of name designations for the units used. The implications of familiar color names might be avoided by using invented words but this is not necessary when writing for a professional audience. Standard color names can be used with the understanding that they mean nothing more than a certain wavelength span. I suggest the employment of the following terms: red, orange, yellow, green, blue, and violet. Intermediate wavelengths may be designated by combinations of these terms; for example, the steps from red to orange might be designated as red, orange-red, red-orange, and orange. A breakdown into more numerous units could profitably carry further this pattern, which is essentially that used in boxing the compass; e.g., red, red-orange-red, red-red orange, etc.

Cards to be used in the field should be identified by numbers placed on the reverse side. An informant invariably turns the card over; therefore no name designation or notation should be used. Cards should be of fairly large size, preferably two inches square or larger. There is no way to avoid rough handling of the cards by informants. Therefore it is well to have extra sets made at the

same time as the original, and to have the pigment placed on heavy cardboard stock. It goes without saying that cards must be presented to the informant in a wholly random fashion. Cards serially presented will elicit many incorrect responses due to carryover of impressions. I have experimented to determine the seriousness of this error; I can say that the results thus obtained are grossly distorted. Indeed, it is essential to keep all cards but the one in use entirely aside or in a covered container or the informant may insist upon comparing one with another. What is wanted from the informant is, of course, simply a name response. This will be recorded in phonetic transcription in the notebook together with the identifying number. It is advisable to discuss the nature of the work with the informant before the session is started so that he may know that no questions, comments, or discussion of any kind should accompany the identifications. My informants have coöperated admirably in this respect, especially when they are told that the whole procedure and all of the questions raised by it will be discussed after the cards have been identified. At this later time much valuable information can be obtained, but if discussion is allowed to interfere with the mechanical procedure the results obtained cannot be used with confidence. In working with bilingual informants, it is necessary to make it clear that the identification and naming are to be done in terms of the native language and that assumed cognate terms must not be used. An intelligent subject invariably carries through without shifting, even at points of difficult identification, to an alternative language; that is to say, to an alternative pattern. Unintelligent or impatient informants generally disqualify themselves by failure to follow instructions. The most common fault is the insertion of English terms at points where the color samples correspond closely to our modes. I have invariably thrown out the list obtained from any informant who mentions even a single English color name because this means that he had shifted to a different color pattern in his thinking.

Before the session it is also important to explain that there are so many color samples that undoubtedly some, or perhaps even many, may call forth the same name. Also, that the informant will doubtless feel that he has no name which is appropriate for some samples, but that in such cases the name should be given which he feels is most closely applicable. In no culture yet studied has any discontinuity been found in the color system, although frequently the color pattern covers a shorter range than the spectral range. When a subject shows marked hesitation in applying a name to a particular sample, it is well to make note of this fact by the use of some simple symbol following the transcription. After all cards have been identified, it is generally possible to determine whether an informant's hesitancy is the result of psychological or cultural factors. If the latter appears

to be the case, it is well to make use of several additional informants. In this way an important feature of the color patterning may be ascertained or, as is more often the case, a general trend in culture patterning may be discovered.

I wrote earlier of the effect upon the color sample of variations in light, reflection, and other such factors. It is essential for scientific validity that the conditions under which the cards are viewed be kept as constant as possible. Experimentation early proved to me that two cards, several steps removed one from the other, might elicit the same response if the colors of the background on which the sample was presented were changed. In other cases, moving from the shade of a tree to the shade of a ramada had the same effect. I have adopted, with experience, a procedure which is followed without variation. A large piece of neutral gray cardboard is used as a background. This is placed flat on the ground or on some other horizontal surface. The card to be identified is placed at the center of this background. The informant is allowed to handle the card but is asked to keep it in a position above the background gray. The site selected is always adjacent to a building, on the opposite side from the sun. In our latitude this is always on the north side, since the work must be restricted to the four to six hours at midday, depending upon the season. Earlier and later in the day the color of sunlight changes so much that identifications are distorted. On the Pacific Coast I have made some observations in an attempt to determine whether midday light in the open on an overcast day is a satisfactory equivalent of northerly shade in the sunlight. While my results are not conclusive, I am inclined to think that this compromise could be made in areas where sunny days are infrequent.

It is well to avoid working in proximity of any strong color, even that of the foliage of a broad-leafed tree. It is also necessary that the building providing the shade be unpainted. These conditions are the rule in an Indian backyard, but in some parts of the world a suitable site might be difficult to find.

It goes without saying that color data must not be obtained indoors. However, the desirability of working indoors and of eliminating the remaining uncontrolled variables in the procedure just outlined have led me to begin experimentation with the use of artificial light. If a light source with the proper characteristics can be devised, it will be superior in all respects to natural light, no matter how well the latter be controlled. The necessary characteristics are: adequate illumination, proper color temperature, efficient diffusion, a simple and unobtrusive arrangement, a battery current source, and easy portability. A successful solution is not yet in sight.

I have found it advisable not to ask questions in advance about quality of

vision, including color-blindness, of the proposed informants. In the analysis of results one immediately becomes aware of any visual defect serious enough to affect the results of the study. When long series of results have been obtained, valuable data are at hand for the illumination of such questions as color-blindness. One of the gratifying things about this type of field work is that so much data of value can be gathered in a short period of time. The average identification session requires less than an hour's time. One never leaves the field with inadequate data because of lack of time or funds, and one never hesitates to throw out a series that is found to be even slightly questionable.

Turning from the technique to the results, I wish first to mention a few incidental but significant types of information which are regularly elicited. I have mentioned data on color-blindness and visual defects; to these may be added color preferences and color symbolism. The names used for colors often indicate the sources from which pigments come, the value placed upon colors and pigments as such, and sometimes the historical point of origin of a particular color term. An example of the last would be a color term derived from the appearance of a horse, such as sorrel in English. Historical depth is also shown in such a term as orange in English. Terms of the latter type likewise indicate the tendency of a people to use names of natural objects as color terms. In the names used above, there are two of this type out of six: orange and violet. In some cultures one finds many more; in others, none. Mechanics for the invention of new words are often very well shown in color terminology. For example, in English one can say blue-green; in certain other languages such a combination would be impossible. Furthermore, in English one may say yellowish-buff and it is meaningful even though the auditor never before heard the term. Some languages carry this process much further; in others the patterning is rigid and innovations are not possible. Some systems abound in references to the environment—flowers, fruit, and the like; in some others all of the terms are meaningless except as chromatic designations.

On fundamental questions I now offer my tentative conclusions. First, the color patterning of man's visual world is not based upon psychological, physiological, or anatomical factors. There is no such thing as a "natural" division of the spectrum. Each culture has taken the spectral continuum and has divided it into units on a quite arbitrary basis. The names applied to these units sometimes refer to the middle color or type of the band in question; in other cases, colors are defined wholly in terms of boundaries without the type concept playing any role. No color system derives from physiological limitations; no color system exploits fully the physiological sensitivity of the human being.

There is no such thing as a blue-green confusion. Indeed, most of the reported cases of blue-green confusion are in reality the result of a great subtlety of classification. The spectral segment containing our twofold division, blue and green, is in some cultures divided into three or four divisions. The middle division contains what we call the blue-green area; it constitutes a unit color as contrasted to the segments of higher wavelength and lower wavelength on either side.

All evolutionary schemes of color vision are shown to be without foundation.

The tri-chromatic theory of the physicists is seriously undermined by our data. This system does not provide for yellow except as a combination of red and green and thereby neglects a color which is strongly emphasized in all patterns recorded. There is, on the other hand, no evidence whatsoever that any people see yellow as a combination of red and green.

There is abundant evidence, however, that people of many different cultures do see blue and yellow in green in the same manner that they see red and yellow in orange. Yet the tri-chromatic theory asserts that green is a unitary color, yellow a mixed color. From our evidence green has far less claim to being a unitary color than does yellow. Culturally, violet, orange, and brown are equally as unitary as are red and blue. It can be safely said that there are no unitary colors in the sense of pure as contrasted to mixed if, as demanded by most theories, green must be considered pure and violet, for example, must be considered as mixed. It should be remembered that the data upon which these statements are based have been gathered from people without experience in the mixing of color pigments. The argument that green is interpreted in Western cultures to be a combination of blue and yellow simply because pigments are thus mixed is therefore eliminated.

Finally, I shall try to answer the question "*Why* do people have a color system?" In sophisticated cultures the answer seems to be found in the descriptive science of the people. The systems are logical and exhaustive; through arbitrary division of the spectrum into segments, the world of color is brought into order. In less sophisticated cultures the process is equally arbitrary and some attempt always seems to have been made to provide a continuous series, but the effects of brightness or luminosity and saturation are often confused with hue so that the resulting systems appear to be more emotional and subjective than scientific in character.

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THE ORIGIN OF THE ADENA CULTURE OF THE OHIO VALLEY

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BY THE CONVENTIONAL METHODS of comparison—prior to the introduction of radiocarbon dating—the time-position and origin of the Adena culture of the Ohio Valley was a matter of special interest to students of the archaeology of the eastern United States. It particular importance lay in the fact that it was regarded as a prominent representative of the earliest culture horizon possessing such fundamental traits as burial mounds, smoking practices, pottery, and, by inference, agriculture. A more specific point of interest was an obvious connection between Adena and the most spectacular development of pre-Mississippi horizon times, the Hopewell culture; this relationship was thought to be lineal, with the Adena culture in an ancestral role. The recently announced dates based on radiocarbon findings demand a reversal of this relationship if they are to be accepted at face value, and the position of Adena would be essentially that of a derivative of Hopewell.[1]

A complete review of the data supporting the earlier chronological position of Adena would be too bulky for inclusion here, but it is possible to state that a number of lines of evidence from several regions point in this direction. Moreover, the radiocarbon dates show inconsistencies other than the Adena-Hopewell situation unless we are to abandon widely-held concepts of the chronological significance of typological similarity. The wisest course would appear to be an attitude of cautious reserve rather than a premature abandoning of a number of our most cherished ideas. In short, the radiocarbon dates will be ignored in this discussion, and the earlier view of the basic position of Adena will be retained.

Something more than fifty years of excavation, including a rather intensive program in Kentucky for the last fifteen years, has provided a sizable body of information on the characteristics of the Adena culture. We are particularly indebted to the University of Kentucky group for their recent excavations and

1 These data are summarized and their implications discussed by Griffin (1951), and additional comments are offered by Webb (1951). Briefly, two central Ohio Valley Adena mounds are dated at 1,168 ± 150 years ago and 1,509 ± 250 years ago, but two specimens from the Hopewell site, Ohio, yielded dates of 2,285 ± 210 and 2,044 ± 250 years ago. The date from a third Hopewell site (Havana, Illinois) was 2,336 ± 250 years ago.

reports, including a summary volume by Webb and Snow[2] on which I have leaned heavily in preparing this paper. An earlier publication by Greenman (1932) summarizes the data obtained from excavations up to 1932. The available information is still badly over-balanced on the mortuary side owing to the nature of the sites, but a substantial amount of direct evidence and reasonable inference on other aspects of Adena culture has accumulated.

Sites of the Adena culture have a rather compact geographical distribution in the Ohio River drainage in the states of Ohio, Kentucky, Indiana, West Virginia, and Pennsylvania. The center of this distribution appears virtually to coincide with the area of intensive Hopewell development in southern Ohio, although the total area showing recognizable Hopewellian sites is, of course, very much larger. Both Webb and Griffin see evidence for a chronological ordering of Adena sites, the former distinguishing a group of Late Adena sites on the basis of a considerable overlap of non-ceramic traits with Ohio Hopewell[3] and the latter[4] making a similar division on ceramic evidence. Griffin's early group includes sites having the pottery type Fayette Thick, which resembles such early wares as Baumer of Illinois and Vinette I of New York; the later sites lack this sort of pottery but show small amounts of check and simple stamped sherds, as well as such pottery features as tetrapods and decorative incising. A dominant pottery type, Adena Plain, links the whole series together. There does not appear to be any serious lack of agreement in these independent chronological judgments. The decided cultural overlap of Adena and Hopewell shown by Webb suggests that his Late Adena sites in Kentucky, where true Hopewell sites are lacking, are contemporaries of the early Hopewell sites of southern Ohio. In any case, the Early Adena or pre-Hopewell sites are linked with those of the later period by a number of traits, and a characterization of the whole as a definite, early cultural tradition seems justifiable.

Most of our information on Adena is derived directly or indirectly from excavations of the earth mounds which are the hallmark of the culture. These mounds are conical in shape (within the limits imposed by loose earth construction) and vary from no more than 2 or 3 feet to nearly 70 feet in height. Their function is clear—typically the mound covers the site of a circular house which contains on or under its floor a log tomb. Webb's interpretation of the Kentucky evidence indicates that a characteristic mortuary sequence consisted of (1) prepa-

2 Webb and Snow, 1945. References to specific Adena traits are drawn from the Webb and Snow summary in this volume unless otherwise noted.

3 Webb and Snow, 1945, pp. 218-219.

4 Griffin, 1945, pp. 220-246.

ration of an elaborate bark- and clay-lined log tomb in the center of the house floor; (2) deposition of a body or bodies, together with grave goods, in the tomb; (3) in some instances, allowing a period when the tomb was left open or temporarily roofed, at the end of which the bones of the now skeletalized corpses were painted; (4) construction of a permanent tomb roof of logs and building a low earth mound over the enclosed tomb; (5) burning the enclosing house; and (6) construction of an earth mound over the tomb, the primary mound, and the debris of the burned house. At some sites additional log tombs were placed in and on the surface of the mound thus formed and covered with earth in turn, resulting in enlargement of the mound. The very large Adena mounds seem to be the result of this practice. This brief sketch is intended to give some idea of Adena burial practices, not to exhaust the subject, as the numerous reported variations in detail are too complex for adequate discussion here. An important point is that the mound burial procedure outlined is plainly confined to a special class, presumably of great prestige, and that more usual funerary practice was simple cremation in the village area with subsequent covering of the cremated remains in place. Some remains of cremations were placed in subordinate positions in the house tombs described above, and still others were simply deposited in the fill of mounds in the course of construction.

Burial mounds usually occur in groups and are sometimes associated with other earthworks, the "sacred enclosures" and "forts" of the nineteenth century antiquarians. The sacred enclosures are frequently circular in form, and an excavated example in Kentucky had within it a circular pattern of post molds nearly one hundred feet in diameter, and almost nothing else.[5] In the immediate vicinity of this circle, surface collections indicated the presence of an Adena village within a fort which was essentially an elliptical ditch enclosing some twenty-five acres. It is not clear whether or not these forts are the remains of palisaded villages, although this would appear to be a likely explanation. On the other hand, Webb emphasizes the absence of evidence for warfare in the Kentucky Adena culture.[6]

Data on the village sites are scanty, being practically confined to such remnants as are preserved under the burial mounds. Circular houses seem to have been almost the only type, the exception being a few fragments of rectangular post mold patterns which were not surely houses. Two clearly differentiated kinds of houses are reported: a smaller type with a diameter of from about 20 to 60 feet and a larger type with a diameter of 100 feet or more. In the smaller type, sturdy

5 Webb, 1941.

6 Webb and Snow, 1945, pp. 315-316.

walls of paired, outward-slanting posts were the rule, and an inner ring of posts presumably served as support for a conical roof. Similar inner rings have not been reported for the larger structures, although there are usually interior post molds, and Webb doubts that buildings of such dimensions were completely roofed.

A complete review of all the other aspects of Adena culture is obviously out of place here, but a number of traits which putatively appear for the first time in this period are of exceptional interest. The most important is the presence of agriculture. Direct evidence for the cultivation of crops is admittedly scanty, since at the moment it consists of a fragment of a cultivated cucurbit from the Cowan Creek Mound in Ohio[7] and an uncertain association of Adena artifacts and several familiar cultivated plants in Kentucky rock shelter sites.[8] The indirect evidence, however, serves to suggest strongly that the only possible basis for the Adena culture was a well-developed agricultural economy. A group having marked social stratification and the ability and leisure to direct efficiently the efforts of large work parties in building elaborate earthworks can hardly have been the seminomadic agricultural dilettantes pictured by some authors. Further, there is undeniable evidence for the cultivation of corn in the immediately following and related Hopewell culture. Probably also connected with agriculture is evidence of smoking in the form of tubular stone pipes; other types of pipes are also reported, although they are rare and probably late in the Adena sequence. A rock shelter find suggests that the plant which was smoked was tobacco.[9] Mortuary concepts, the non-mortuary earthworks, and house types have been mentioned above. The use of the stone celt as a heavy cutting tool to the exclusion of the widespread Archaic period grooved axe, the manufacture of thin plate copper ornaments (finger rings, bracelets, gorgets), engraved stone tablets, and a variety of textiles of excellent quality all contrast with the practices of the immediately preceding Archaic cultures. Another novel cultural trait is a very extensive practice of cranial deformation by the Adena people; the typical form is occipital flattening, but bifrontal deformation is also recognizable, and very recently Snow has reported a third type involving a circular constriction in a more or less horizontal plane.[10] Finally, the Adena population represents a homogeneous, broad headed physical type which is unequivocally different from the well known Archaic (Indian Knoll) type.[11] It is possible to exaggerate the Archaic-Adena differences, however, even

7 Griffin, 1951, p. 28.

8 Webb and Funkhouser, 1936; Webb and Snow, 1945, pp. 312-313.

9 Webb and Funkhouser, 1936; Webb and Snow, 1945, p. 314.

10 Snow, 1951.

11 Webb and Snow, 1945, p. 251.

if they do appear to be fundamental; for example, certain chipped and ground stone forms do indicate some sort of continuity between the two culture types.

Explanations concerning the processes underlying this exceedingly important change in the course of cultural development in the Ohio River drainage in every case involve stimulus from outside the eastern United States. Botanical evidence alone precludes an assumption of initial domestication of such plants as corn and squash within the territory of the Adena group. This encouraging unanimity of explanations breaks down above this level, and opinions range from an outright migration from an area described as Mexico or Middle America[12] to a simple diffusion of basic agricultural traits from Mexico or the Southwest with subsequent development in place. Areas other than nuclear America are also invoked. Asiatic origin for Adena pottery, burial mounds, and physical type has been suggested, and still another view would shift the whole problem of the transformation of Archaic hunting and gathering peoples into the Early Woodland agriculturists to the lower Mississippi Valley.[13]

The major purpose of this paper is a defense of the migration theory as being the most economical explanation of the observed and inferred complex of traits, plus the further suggestion that an early phase of the Circum-Caribbean culture of Steward represents the ancestral matrix from which the Adena people and their culture were derived.

Factors favoring a hypothesis of actual migration, as opposed to diffusion, are quite simply the inferred simultaneous appearance in the Ohio Valley of a new physical type and a constellation of new cultural traits. At the present time a resort to migration as an effective explanation of cultural change has fallen into disfavor among many archaeologists in the eastern United States owing to a patent abuse of the concept in earlier years. It is, nevertheless, a valid cultural process which cannot be discarded on theoretical grounds. If future investigation discloses a finely graded series of sites ranging from Archaic to full Adena culturally and having a population evolving *in situ* from the earlier long headed people to the Adena broadheads, then the migration hypothesis will have to be discarded. It does not seem likely that such a series exists.

The specific derivation of the Adena people from an area having a recognizably Circum-Caribbean type of culture rests on a comparison of the Adena trait list with the summaries of Steward and the accounts of various prehistoric and

12 *Idem*, p. 327.

13 Ford and Quimby, 1945, pp. 92-93. Ford and Quimby also speculate on a possible Central American origin for pottery, tubular pipes, and perhaps burial mounds (*idem*, p. 95).

historic cultures of northern South America and its isthmian extension.[14] It should be emphasized at the outset that a comparison of this nature is inherently weak because the South American material represents a geographical and temporal mélange. As a consequence, the outcome of the comparison is at best a suggestion or point of view for the interpretation of future archaeological findings. Ultimate proof must take the form of an unmistakably Adena-like archaeological culture associated with the Adena physical type within striking distance of both the Circum-Caribbean area and the eastern United States and of sufficiently early date to provide the source of Adena. The most promising area on geographical grounds would seem to be the northern part of the tropical lowlands of the east coast of Mexico in view of Rouse's conclusion that there is little possibility of transmission of peoples and culture of advanced type through the Antilles at this relatively early date.[15] A cursory examination indicates that the archaeological data for this area do not seem either to demonstrate or deny the existence of such a culture. It is at least slightly encouraging to read Ekholm's conclusion[16] that the earliest cultures in the Tampico-Panuco area were related primarily to others farther south on the Gulf Coast and even into Central America. This view of the origin of Adena is essentially a special application of the general concepts presented by Willey.[17]

Adena traits which seem to suggest Circum-Caribbean affiliations in greater or lesser degree include the mortuary concept, with its tombs in earth mounds, multiple burials having a central inhumation with subsidiary inhumations or deposits of cremated remains (this practice is considered by Webb to indicate actual killing of retainers to accompany the body of a chief), burial on or under a house floor with subsequent burning of house, use of a considerable amount of grave goods including trophy skulls (one of which was painted), and sharp social differentiation shown in burial practices, with simple cremation for ordinary folk. Head deformation, tubular pipes (probably tobacco pipes), and the large circular houses are also relevant. Although our information is not conclusive, we may suspect the presence of villages fortified by earthworks and palisades in Adena. In the field of arts and crafts, rather elaborate weaving and utilization of cold-worked sheet copper for ornaments can be mentioned. J. B. Griffin has pointed out to me that the carved Adena tablets of stone are a particularly interesting trait in this connection, as they resemble certain Mexican tablet stamps of unknown

14 Steward, 1947; Steward, 1946-1950, vols. 4 and 5, *passim*.
15 Rouse, 1949.
16 Ekholm, 1944, p. 503.
17 Willey, 1949.

age, the resemblance extending even to design details.[18] Webb has suggested, on the evidence of traces of paint on one of the Adena specimens, that the Adena tablets were also stamps.[19] Perhaps significantly, the Mexican examples which most strongly suggest Adena are said to come from the Vera Cruz area. The Adena preference for the stone celt as opposed to the Archaic and Hopewell grooved axe has been mentioned above. The grit-tempered, flat-bottomed Adena Plain jar with its occasional tetrapod supports is at least not incongruous in this context. If there are Adena prototypes for Hopewell painted cloth, wrap-around skirts, copper ear spools, and copper panpipes, as seems possible, the case for connection is further strengthened. There is probably little to gain at this stage of our knowledge from a typological refinement and extension of this list of parallels; the purpose here is to bring this situation to the attention of Middle and South American specialists so that a more expert appraisal can be made.

To translate these supposed parallels into historical terms, it would seem that the Adena culture appeared in the Ohio Valley as the result of a migration from lowland eastern Mexico. The migrants would have been essentially tropical forest peoples whose culture possessed strong Circum-Caribbean affiliations. The reasons for the migration and the ultimate arrival in the Ohio Valley are not apparent except for the minor suggestion that the Texas plains would hardly constitute an attraction for a forest people. The indigenous cultures of the area would have been those of a series of non-agricultural peoples who had over a long period developed something close to the highest cultural level possible to hunting, fishing, and gathering groups in the environment of the eastern United States. Among other traits, the pre-Adena native peoples may have possessed pottery of Asiatic origin and, in the north, a utilitarian copper industry. They clearly had a rather extensive trade in the special products of the various regions, and the flow of products along their accustomed channels continued in the subsequent agricultural period. The introduction of agriculture and other traits by the Adena people supplied the basis for a new series of developments which culminated in the Hopewell culture. It seems possible that Hopewell arose in the Illinois Valley, a non-Adena area, as a result of strong Adena influence on a native culture of essentially northern type, and that a subsequent expansion replaced the Ohio Adena with a Hopewell variant. Although in this view the Adena people would

18 Enciso, 1947, especially Plate 85, VII. A comparison of the Adena tablets illustrated by Webb (1940, pp. 115-127) and the Mexican stamps shows, for example, the common use of a border of triangular notches in addition to the strikingly similar bird motifs. Ekholm, however, reports (1944, p. 472) finding only five tablet stamps, all from his relatively late Period V, in the course of his work in northeastern Mexico.

19 Funkhouser and Webb, 1932, p. 305.

have been primarily cultural donors, it is not necessary to assume that they would be entirely uninfluenced by the surrounding peoples. Indeed, we have direct evidence that this did happen in the form of trade pottery wares, use of copper, and chipped and ground stone tools and ornaments. The apparent difference in cultural intensity of the Adena proper as opposed to Hopewell can be interpreted as the result of a period of adaptation of tropical forest agriculture (crops, tilling practices, and resulting settlement patterns) to the potentially superior Middle Western soils.

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POLLUTION AND TABOO IN CONTEMPORARY JAPAN

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CEREMONIAL POLLUTION (*kegare*) and practices of taboo or abstinence (*imi*)[1] associated with pollution as they apply in the daily life of the Japanese are subjects which have been accorded attention in Western accounts of prehistoric and early historic Japan. Western writings which deal with the past or present religions of Japan emphasize the importance of cleanliness and purification in Shinto belief and ritual.[2] Modern Western accounts of contemporary Japanese culture contain brief mention of *kegare* and *imi* as things of the past which have remained important as the core of Shinto priestly or shrine ritual and which exist today among the general population only in a few attitudes and customs. The beliefs and practices of *kegare* and *imi* still exist, however, in fairly elaborate form in many communities of rural Japan and their influence, at least, remains among people of urban areas.

It is with the objective of attempting to present current data on this subject as it applies in the life of the ordinary individual in contemporary Japan that this paper is written. The data and observations set forth are drawn in part from the author's field work in Japan, in part from such publications as are at hand on this subject by Japanese scholars, and, of necessity, in lesser part from the publications of Western scholars.

References to pollution and taboo in Japan are first found in the Chinese Han and Wei chronicles describing a country thought to be Japan. The earliest references in native Japanese writings appear later in the recordings (of uncertain date, perhaps the end of the seventh century) of *norito,* Shinto liturgies which are largely purificatory prayers, and in the historical-mythological accounts, the *Kojiki* and *Nihongi* (compiled in 712 AD and 720 AD, respectively, but tracing Japanese history from a much earlier period). In his description, based upon the early Chinese and Japanese writings, of the religion of Japan before the intro-

1 The range of meaning of the term *imi* is wide. It may, according to context, mean taboo or abstinence, pollution, or purification. "*Imi* is the word representing not only the most unclean . . . status, but also the most pure and clean status" (Ōmachi, personal communication). As used in this paper *imi* means taboo or abstinence during an unclean period.

2 See, for example, Holtom, 1938, or Aston, 1905.

duction of Buddhism (customarily dated 552 AD), Sansom emphasizes the importance of ritual purity:

> The outstanding feature of Shinto observances is the attention paid to ritual purity. Things which are offensive to the gods were called by the early Japanese *tsumi*, a word which is now rendered by dictionaries as "guilt" or "sin." Avoidance of these things was called *imi*, a word meaning taboo. . . . Sexual intercourse, menstruation and childbirth were regarded as causing ceremonial impurity, which must be removed by lustration, abstention, and prayer. In the earliest myth there is mention of "parturition huts," isolated sheds to which pregnant women withdrew so that the dwelling-house should not be defiled by childbirth, and we are told also of "nuptial huts," in which, for a like reason, marriages were consummated. Disease, wounds and death were also sources of uncleanness. Death—or rather the contamination of death—was abhorrent to the early Japanese. . . .[3]
>
> Purification was essential before worship and was achieved by various methods, exorcism (*harai*), cleansing (*misogi*), and abstention (*imi*) . . . perhaps the most interesting method of purification is *imi* or abstention . . . a method of acquiring a positive purity by avoidance of the sources of pollution. It was therefore the duty of priests rather than of laymen to practise the needful austerities, which consisted chiefly of the observance of certain prohibitions. They must avoid contact with sickness, death, mourning; they must eat only certain kinds of food and those only if cooked over a "pure" fire; they must wear only specially purified garments; and they must remain indoors, remote from noise, dancing and singing. Scrupulous care must be taken to avoid contamination of the sanctuary, the offerings and the utensils.[4]

Sansom also calls attention to a number of vestiges and survivals of earlier cleansing rites: the washing of hands and rinsing of mouths before entering a shrine;[5] the use of salt for purification in dwellings and at the edges of wells; the presentation of salt as an offering at shrines; the basin of water placed outside privies "used for rinsing the hands in a manner so perfunctory as to be merely symbolic"; and the Japanese indulgence in hot baths.[6]

Western observers writing of contemporary Japan toward the close of the nineteenth century and during the early twentieth century to some extent noted household practices connected with ritual pollution. We find, for example, a clear although brief description by Lafcadio Hearn of household practices at times of death and veiled references to menstrual taboos.[7] For the most part, however, Western accounts of Japanese religious beliefs hardly touch upon the practices

3 Sansom, 1943, pp. 52-53.

4 *Idem*, pp. 59-61.

5 It has become customary to translate the Japanese term for a Shinto edifice as "shrine," and the term for a Buddhist edifice as "temple."

6 Sansom, 1943, p. 60.

7 Hearn, 1894, pp. 400-401.

associated with ritual impurity as observed by the average individual, and this topic is conspicuously lacking in the more contemporary publications. One reason for the lack of material on this subject in contemporary accounts is that the practices are rapidly disappearing. Another and perhaps better reason is that there are extremely few accounts dealing with rural Japan, the area where the old ways have lingered longest.[8]

While engaged during 1950-51 in a field study of the Inland Sea fishing community of Takashima in Okayama Prefecture the author was impressed with the survival of these ancient customs surrounding the crises of life in communities which are otherwise in many ways well on the way to twentieth century modernization. Takashima and its neighboring communities in Okayama Prefecture are not retarded areas but are, rather, perhaps somewhat above the average in degree of modernization for rural Japan as a whole. All or nearly all persons of these communities are members of the Shingon sect of Buddhism and also believe in a number of non-Buddhist or Shinto deities. The beliefs and practices of *kegare-imi* as they now exist in Takashima take the following form.

Menstruation, childbirth, and death are the major sources of pollution. During periods of pollution certain abstinences or taboos must be observed, which, although basically alike, vary somewhat in accordance with the source of pollution.

During menses women are regarded as polluted and must avoid contact with Shinto deities for fear of polluting or offending them with their unclean presences. A menstruating woman may not follow her usual practice of making daily or intermittent offerings of foodstuffs before the several shrines to household gods within the dwelling. Visits to community or public shrines are also prohibited, but if it is for some reason necessary for a woman to visit such a shrine she may do so if she goes around and does not pass through the entrance gate (*torii*). Partly for fear of extending pollution to other household members and partly for more practical reasons, a woman must not take a bath in the household tub during this period. In some households, pinches of purifying salt are placed on all household shrines during this and any other periods of *kegare* of any member of the household. Food prepared by a woman during the last day of her menstrual period, because it is prepared over an unclean fire (a fire polluted by her presence), is usually consumed entirely on that day even if it is necessary to have an extra snack late in the evening. On the morning following the last day of the menstrual

8 Japanese scholars are, of course, well-informed on this subject, but their writings are in Japanese, which virtually serves to place them under lock and key. The author knows of only one work in English dealing with this subject for contemporary Japan, the little-known English translation of a paper by the Japanese scholar Tokuzō Ōmachi (Ōmachi, 1942).

period a new fire is traditionally built and, pollution now removed, the household enters a new and clean period. The building of a new fire is called *hikaeri,* which may be translated as "changing the fire," or "renewing the fire."[9] In the actual course of present-day life a new fire is built daily in the kitchen cooking devices, lighted with a match, but the practice is still referred to by the traditional name of *hikaeri.* Some women also sprinkle salt upon their clothing at this time, and all women usually bathe.

Until about twenty-five years ago menstruating women took meals separately from other adult members of the household to avoid polluting them, and thereby also extending the taboos to them. It was considered essential that the normal offerings be made to the household deities and these could be made only by unpolluted persons. The menstruating woman of twenty-five years ago also had to avoid all of the numerous small wayside shrines to Shinto deities in the village in the course of her daily activities. To pass a shrine or the statue of a Shinto deity it was necessary for her to take a circuitous route, passing behind or far in front. At the present time a menstruating woman is not ordinarily thought seriously to pollute other persons—in any case, the date of the occurrence of menses is seldom known to other persons—but she is still capable of polluting any Shinto deity by close presence, offerings, or prayers. If the woman of today passes a shrine or Shinto statue along the normal avenues of travel while in menses it is no longer thought to be defiling or offensive to the supernatural being concerned.

At childbirth the period of *kegare* covers thirty-two days (always referred to as a thirty-three-day period, but the day of birth is counted as the first day). The degree of pollution diminishes as time passes; at least two stages are clearly distinguishable.

Childbirth takes place in one specified room (the *nando*) of the house in which there are no shrines to household gods. Water used in sponge-bathing the mother and child is considered polluted and is poured into a hole dug in the ground beneath the elevated floor of the room in which delivery takes place. Soiled cloths used during the delivery may also be placed in the hole, which is filled with soil and sometimes sprinkled with salt. The placenta is carefully buried, just inside the dirt-floored entrance room if the child is a male and just outside the entrance if female. This is said to be so that a son will remain at home and a daughter will marry and leave the home. The umbilicus is preserved, wrapped in paper and tucked away in a drawer, and may be kept until the death of the person concerned, when it is placed in the coffin together with his body. It is, however, usually lost long before this time and no further thought is given to it. There appears to be

9 *Hikaeri* is also used to mean the termination or terminal day of a period of pollution.

little relationship between *kegare-imi* beliefs and the practices associated with the placenta and umbilicus. The practices instead suggest ancient and forgotten customs of sympathetic and exuvial magic.

A simple naming ceremony consisting of the ceremonial offering of a tray of food to the infant and the conferring of a given name is held on the seventh day after birth. This appears associated with beliefs of *kegare* and to represent the termination of what may formerly have been one of the stages of childbirth pollution. Close relatives, and sometimes unrelated persons, may join with household members at this time for a simple feast.

During the whole duration of the thirty-two-day period the new mother is under the same restrictions as the menstruating woman, but because childbirth is considered more seriously defiling than menstruation, there are additional abstentions. A woman is restricted during the whole period from entering or leaving the house through rooms which contain household shrines.[10] During the first fourteen days (referred to as a fifteen-day period) after parturition the mother may do no cooking. If she has occasion to step outside the dwelling during this period she must cover her head with a towel or cloth to avoid polluting the sun (i.e., the sun goddess, Amaterasu-ō-mikami). For the same reason, the washed clothing of both mother and child must be hung to dry in the shadow of the eaves of the house during this first fourteen days. In some households new mothers take meals separately from other household members until the fifteenth day. After a ceremonial washing of the hands in ordinary water on the morning of the fifteenth day pollution is sufficiently removed so that the mother may resume household cooking and so that she may again bathe in the household tub. Pollution is not, however, altogether removed at this time, and the abstentions observed by a menstruating woman continue to be observed by a new mother until the thirty-third day. In former times, continuing until about twenty-five years ago, a woman could not draw water from a well during this post-parturitional period, presumably for fear of offending Suijin-sama, the god of the well. When the thirty-third day has arrived, *hikaeri* is done and the floor of the house and the clothing which the mother is wearing may be sprinkled with salt.

The new mother is also subject to food taboos. These are said, however, to bear no relation to *kegare-imi* beliefs. They are instead traditional measures, prescribed and circumscribed foods which are thought to improve the health, promote lactation and aid in the passing of post-partum discharges.

10 All rooms are separated by sliding partitions and it is possible to enter or leave the room in which childbirth takes place without passing through rooms containing household shrines to Shinto deities. It is permissible to pass the Buddhist altar which is found in every dwelling.

Death is another period of serious pollution. All persons who come into contact with the body of the deceased or who are closely related to the deceased are polluted. Periods of *kegare* formerly varied with closeness of relationship to the deceased from forty-nine days (ending on the fiftieth day) for children, parents, or spouse of the deceased to three days for cousins.[11] Until about thirty years ago all members of the community (i.e., the *buraku*, a small face-to-face residence community, a number of which, usually somewhat separated from each other, comprise a village) were considered polluted for a period of three days. Today the only non-relatives to whom *kegare* extends are the members of the *kōrenchū*, a communal funeral organization composed of one adult member from each household in the *buraku* which serves to aid the household of the deceased with ordinary household tasks such a cooking and with funeral arrangements. *Kōrenchū* members are under three-day *kegare*. It has become customary today to consider the period of pollution ended for all persons after the various funeral rites have been completed, usually three days after death. A person polluted by a dead body is now ordinarily not considered seriously to pollute others. There is, however, some avoidance of close relatives of a deceased person during the three-day funeral period. Members of the household of the deceased must do no work during this three days, and must avoid any contact with Shinto deities.

Funerals are the province of Buddhism, and ideas of pollution and taboo are said by Takashima informants to have no bearing upon Buddhist beliefs and practices.[12] During the three-day funeral period special precautions must, however, be taken to protect the household Shinto deities from contamination. Images and votary dishes are sometimes removed from household shrines and put out of sight. It is customary to attach papers bearing the two ideographs for the word *kichū* to each household shrine, where they are allowed to remain until the funeral period has ended. A *kichū* paper is also placed on the outside wall beside the entrance to the dwelling where it serves as a warning to strangers and the

11 An article by a British writer states that no fixed rules on the periods of defilement for relatives existed until the tenth century. Authority for this statement is, however, not cited (Lay, 1891, p. 525). Ōmachi states that in former days funeral taboos commonly ended on the fiftieth day, but at present they frequently end on the forty-ninth day (personal communication). There appears to be a correlation with Buddhist practices here. Funerals in Japan are generally in accordance with Buddhist ritual, and the first of many Buddhist memorial masses is commonly held on the forty-ninth day after death.

12 Although basically "native" or Shinto beliefs, *kegare* and *imi* appear to have affected and in turn to have been affected by Buddhism in at least the matters of the period of duration of pollution and food taboos. The so-called "native" or Shinto beliefs and practices and those of Buddhism are by no means always clearly distinguishable, either to the foreign observer or to the average Japanese, who is both a Buddhist and a Shintoist. See footnote 11.

uninformed. The term *kichū* is customarily translated as "mourning," a translation which obscures the connotations or original meaning of the word. *Ki* is an alternate reading of the ideograph used to represent the word *imi*. *Chū* means "in the midst of." *Kichū* may thus perhaps more accurately be translated in this context as "under taboo."

A small fire of rice straw (*kadobi*) is built in the yard at the time the coffin containing the body of the deceased is removed from the dwelling to be taken to the graveyard. A dish—theoretically one used by the deceased but usually simply the one in poorest condition—is also broken at the same time. The stated significance of these symbolic acts is that by having three major calamities (a death, a fire, and the breaking of something) occur simultaneously none of them is apt to recur in the near future. It is suggestive that the fire may once have been a form of purification.[13] It is also the custom to sweep with a broom the ground in the yard over which the coffin has been transported on its way to the grave. This is said to remove pollution and to wipe out the footprints of the funeral party so that the spirit of the deceased will be unable to find its way back to haunt its former dwelling.

No food of animal origin—fish, shellfish, or meat—may be eaten during the three-day funeral period. This is regarded as a Buddhist practice and is said to be unrelated to the beliefs of *kegare-imi* although some food taboos appear formerly to have been among the abstentions of *imi*.[14] It is also customary, for reasons now unknown, that a number of practices followed in the household of the deceased during the funeral period be the reverse of normal procedures; e.g., water is ladled with a backhand motion, and the folds of the *kimono* of the deceased are placed atop one another in reverse fashion.

When funeral *kegare* has ended, each polluted person purifies himself by sprinkling salt on his clothing and by bathing. A "new" fire is built in the dwellings of the deceased, his close relatives, and all members of the communal funeral organization. Distantly related or unrelated persons who attend only the funeral ceremony at the time of inhumation and who are not members of the funeral organization sprinkle their clothing with salt after they have returned home from the funeral but ordinarily practice no other abstentions. Certain items of funeral

13 Chamberlain interprets the funeral *kadobi* as a form of purification. A *kadobi* is also commonly built at the time a daughter leaves the home to marry. Chamberlain regards this as being identical with the funeral fire; the daughter is considered dead to the household of her procreation (Chamberlain, 1898, p. 272).

14 Sansom, 1943, p. 61; Anesaki, 1930, p. 35.

paraphernalia, such as the coarse straw sandals worn by the pallbearers (*kōrenchū* members), are considered unclean and are thrown into the sea.[15]

Sexual intercourse is, with one exception, no longer considered as resulting in pollution. Some persons regard intercourse with prostitutes as defiling. A few persons still follow the practice, said to have been observed until about twenty years ago by all persons thus defiled, of sprinkling salt upon their clothing after sexual relations with prostitutes and before re-entering their own homes. The patronizing of prostitutes (by persons of the community here described) is in any case uncommon, limited principally to occasional instances among young, unmarried men.

Household practices very similar to those described above for the community of Takashima are also reported from numerous other rural areas of Japan in accounts by Japanese scholars. Ōmachi, in a paper published in 1942 which is apparently not intended to be a comprehensive areal treatment, reports the existence of these practices in communities located throughout nearly all of Japan, including the Island of Tsushima in the Japan Sea, and also in the Ryukyu Islands.[16] Ōmachi estimates that survivals of *kegare-imi* beliefs and practices similar to those of Takashima may be found today in approximately half the rural settlements of Japan, particularly in fishing communities.[17] The customs as reported by Ōmachi and other Japanese scholars, although fundamentally like those of Takashima, exhibit considerable local variation.[18]

Childbirth and menstruation are frequently both termed "the red uncleanliness,"[19] and the practices surrounding them are much alike except in the duration of time. The length of the period of *kegare* at childbirth is reported as extending from seven to seventy-five days, with a period of seven days being common.[20] In a few communities fathers and other household members as well as mothers are considered polluted at childbirth.[21] Rarely, persons closely related to the mother who are members of households different from that of the mother may also be considered polluted at childbirth.[22] A woman under childbirth pollution is avoided in a number of communities, and menstruating women may also be avoided if

15 This, again, is said to be a Buddhist practice.

16 Ōmachi, 1942, pp. 1-11, 31-45.

17 Personal communication.

18 See Japanese works in bibliography and Ōmachi, 1942.

19 Segawa, 1949, p. 364.

20 *Idem*, pp. 364-373; Ōmachi, 1942, p. 1-11; Kagawa-ken Minzoku Chōsakai, 1950, and other Japanese works in bibliography.

21 Segawa, 1949, p. 354; Ōmachi, 1942, pp. 2-3.

22 Segawa, 1949, p. 354.

the condition is known.[23] In the rare instance, even pregnant women are reported as being avoided by other persons.[24]

Among the more frequently reported abstentions for women under menstrual or childbirth *kegare* are the cooking of food over a separate fire (i.e., charcoal brazier or, rarely for this purpose, an earthenware stove) and/or the eating of meals separately from other members of the household.[25] The rare survival of parturition and menstrual houses, sometimes communal and sometimes the property of individual households, is reported in isolated areas.[26] A woman at childbirth may retire to an outbuilding situated very near the main dwelling, where her food is prepared over a separate fire. More frequently, a separate fire may be made in one corner of the kitchen where the food of the polluted woman is prepared by herself or by another female and eaten after other household members have had their meals, prepared over the regular cooking devices by an unpolluted woman. In a number of communities which no longer observe isolation at these times the period of menstrual or childbirth *kegare* is still known by terms such as *betsuya, bekka, betsutaku,* and *bunya,* all of which may be translated literally as "separate house," or by terms such as *betsuhi,* "separate fire."[27]

Although a large number of instances of the use of separate fires and a lesser number of instances of the practice of isolation or semi-isolation are cited, it appears that in most communities where the taboos still remain, women during menses continue cooking and taking meals with the household in the normal fashion. Childbirth, in most communities today, takes places in one specified room of the house. The principal abstinence observed during either childbirth or menstrual pollution is the avoidance of contact with Shinto deities by the women concerned. When the period of defilement has ended, purification is usually accomplished by sprinkling salt upon clothing, by the building of a "new" fire, and by bathing (occasionally by bathing in the sea). There is a tendency to avoid joining others in coöperative tasks, a tendency which is particularly strong in fishing communities where polluted women may be prohibited from entering fishing boats for fear of polluting Funadamasama, the god of boats. The survival of menstrual and childbirth *imi* is reported as stronger in western than in northern Japan.[28]

23 *Idem,* p. 353 ff.

24 *Ibid.*

25 Numerous examples may be found in Japanese works listed in bibliography.

26 Segawa, 1949; Ōmachi, 1942, 1950.

27 *Ibid.*

28 Segawa, 1949, pp. 364-373. The term "western Japan" as used by Japanese refers to Kyushu, southern Honshu, and may include Shikoku, an area which American or Europeans are more apt to think of as southern Japan. The term for the geographic area here translated as "northern Japan" is Tōhoku.

Beliefs of pollution at death, sometimes referred to as "the black uncleanliness," are also widespread, with local variations in *imi* practices. The period of death pollution is usually based upon closeness of relationship to the deceased and varies locally from a few days to a much longer period, with a term of forty-nine days for close relatives being common.[29] *Kegare-imi* at death does not always apply as strictly to genetically unrelated spouses of deceased persons as it does to close blood relatives.[30]

In former times the abstinences of death *imi*, as during any other period of pollution, were observed in huts or sheds built especially for that purpose in places somewhat removed from the community or situated beside the grave. These huts were known by a variety of local names, one of the most common of which is *moya* ("*imi*-house"). The use of such mourning huts appears to have almost, if not entirely, died out, although a number are reported as existing within the memory of presently living persons.[31] In a few present-day communities one room of the dwelling or a room in a close-lying outbuilding is set aside as a mourning room and the head of the household lives a life of retirement there during the period of pollution.[32] The chief mourner (usually the head of the household, less frequently the spouse of the deceased if the spouse is not the household head) may in some communities have his meals prepared over a separate fire and eat separately.[33] In still other instances, the close relatives of the deceased eat food prepared over one fire (the "old" fire) and the unrelated or distantly related members of the communal funeral organization (common in rural Japan) have their food prepared separately.[34] A funeral custom commonly observed is the ceremonial offering of rice to the deceased. In some communities this rice must be prepared over a special fire and close relatives partake of it.[35] Women polluted by the death of a relative may be obliged to cover their heads while outside their dwellings, as the women of Takashima do after childbirth.[36]

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29 Sakurada, 1942, p. 206; Ōmachi, 1942, pp. 35-37; Makita, 1949, p. 251 ff; Chamberlain, 1898, pp. 296-297.

30 Makita, 1949, p. 260 ff.

31 Ōmachi, 1942, pp. 33-37. Ōmachi and Sakurada each report one instance of the present existence of separate structures for death *imi*. Ōmachi reports the building of a hut beside the grave (Ōmachi, 1942, p. 37); Sakurada cites the erection of a temporary hut immediately in front of the dwelling (Sakurada, 1942, p. 205).

32 Sakurada, 1942, pp. 205-207; Makita, 1949, p. 251 ff.

33 *Ibid.*

34 Makita, 1949, p. 251 ff.

35 Ōmachi, 1942, p. 33; Makita, 1949, p. 251.

36 Kagawa-ken Minzoku Chōsakai, 1950, p. 22; Makita, 1949, p. 262.

The horror with which death and pollution from death were formerly regarded in Japan is still reflected in a number of communities. A man who eats anything cooked by an unclean ("old") fire at the time of a death is reported as being looked upon with so much dread by the people of Yamagata village, Kunohe-gun, Tosa, that "people believe . . . his visit to a garden will make the vegetables blighted and that silkworms will all die if he enters the silkworm-raising room. . . ."[37]

Pollution from the death of a household member may be thought to extend to animals and pets owned by the household. Horses or cows may be exchanged or temporarily sold to relatives. The evil influence of pollution is here seemingly limited to the members of the household of the deceased. Through the exchange of animals or the formality of buying back a cow or horse, by pre-arrangement, the evil is thought to be avoided.[38] It is suggested that the custom, known throughout much of Japan, of releasing caged birds at funerals may also be a reflection of pollution spread to animals.[39]

Food taboos during death *kegare* appear as a whole to be few, and there is local variation. The eating of fish or meat is generally circumscribed, a custom which appears to be the result of Buddhist influence.

In most communities where customs of death *kegare* and *imi* still exist, present-day practices appear to be relatively simple and resemble those described for Takashima. *Kichū* papers or, less commonly, other symbols of mourning such as crossed sections of bamboo before the house entrance, are found almost everywhere, including the cities of Japan.[40] The building of "new" fires at the end of a period of pollution remains fairly common. Other methods of purification are the same as those described for menstrual and childbirth pollution with the addition of the occasional use of rice wine (*sake*). Rice wine used in ritual to remove death pollution, although always drunk, may be known as "body-washing rice-wine" (*miarai-sake*) or "hand-washing rice-wine" (*tearai-sake*).[41] Persons polluted by death avoid contact with Shinto deities, and to some extent avoid and are avoided by other persons. In many fishing communities persons under death pollution do not enter fishing boats or take part in any joint work.[42] Rare examples

37 Ōmachi, 1942, p. 34.

38 *Idem*, pp. 37-38.

39 *Idem*, p. 38. Nishikiori reports the freeing of birds at funerals "to cheer the souls of children" (Nishikiori, 1945, p. 68).

40 Ōmachi, 1942, pp. 31-32; Makita, 1949, p. 260.

41 Ōmachi, 1942, pp. 35-36.

42 Makita, 1949, p. 261.

are also cited of taboos against washing, bathing, or shaving beards during death pollution.[43]

Few data are available on beliefs of pollution from sexual intercourse or wounds. An isolated instance of the avoidance of newly-wed males for three days after marriage is reported. In the community in question newly-wed males are also prohibited from joining in fishing operations during the first three days after marriage.[44] One instance of a dislike and avoidance of wounds is noted.[45]

In brief summary of the data presented, the abstentions or taboos generally practiced during pollution from any source are some degree of avoidance of other persons and fairly complete avoidance of contact with Shinto deities.[46] Avoidance of other persons may extend to actual isolation, and may exclude participation in normal coöperative work activities or any tasks which involve contact with other persons. During periods of pollution social gatherings are avoided, particularly those of a festive or light-hearted nature. As practiced in the home, purification for pollution from any source is usually accomplished through washing the body with fresh water and by the use of salt. Fire itself is generally regarded as pure but household fires may become polluted, and the starting of "new" fires when a period of pollution has ended remains fairly common.[47] The end of a period of pollution is often marked by a festive gathering of relatives and friends during which the formerly polluted person or persons once again partake of food with others. At the end of a period of death pollution fish is certain to be included among the items of food. A type of rice cake called "forty-nine-day *mochi*" is also often eaten at the end of death pollution.[48]

Reference to pollution and taboo (except food taboos, apparently unrelated to *imi*) are absent from Embree's account of rural Japan, *Suye Mura*,[49] although it

43 *Ibid.*

44 Segawa, 1949, p. 353.

45 *Idem*, p. 355.

46 The attitude toward Buddhist supernatural figures is unclear. In the community of Takashima *imi* is said not to apply to Buddhism, but this is perhaps untrue of other communities. Distinctions between Buddhist and Shinto beliefs and deities are often blurred. To give but one example, the Buddhist Jizō, regarded commonly as the patron saint of children, is prayed to and treated as a Shinto god. Ōmachi interprets the periodical Buddhist memorial masses, conducted upon the anniversaries of death at various years on up to the fiftieth anniversary or beyond, as periods of *imi*, expiration stages of ever-diminishing pollution (Ōmachi, 1942, pp. 41-42).

47 Sparks from flint and steel may be used in purification and are also used as a means of protection before starting out on a trip of some distance or before beginning a venture considered of importance.

48 Makita, 1949, p. 254.

49 Embree, 1939.

appears that the beliefs and customs in at least vestigial form existed in the locality he describes. It has been suggested that one reason for the absence of *kegare-imi* from Embree's account is that the dominant Buddhist sect in Kumamoto Prefecture, in which Suye Mura is located, is Jōdo Shinshū. It is thought that in areas where Jōdo Shinshū prevails, beliefs and practices of *kegare* and *imi* are weaker than in areas where other Buddhist sects or Sect Shinto predominate.[50]

Implicit evidence of the existence of these beliefs in Suye Mura appears, however, in Embree's discussion of *hiaki*. In discussing birth practices Embree states:

> At thirty-one days if a boy, thirty-three if a girl, a child is taken to visit the shrine of the village patron god. . . . This day and event are called *hiaki*. Before this time the child has not been carried across rivers or on the back. . . . During the first thirty days or so of a child's life his soul is not very well fixed in his body—it is a period of danger and uncertainty. *Hiaki*, therefore, represents the end of the birth period and is, significantly, the same term as that used for the end of the forty-nine-day period of mourning for the dead. . . .[51]

With regard to *hiaki* at death, Embree states:

> The last of the seven seven-day *kuyō*[52] (memorial services) is called *hiaki* and represents the end of the mourning period just as *hiaki* after birth ends the danger period of the infant; food taboos are now lifted.[53]

The term *hiaki* is widely used throughout Japan to express the termination of a period of pollution. It may be translated literally as "expiration of the fire," or "expiration of *imi*."[54] It is synonymous with the *hikaeri* used in Takashima and with another widely known term, *imiaki*, "expiration of *imi*." The words *hi* (fire) and *imi* are in many cases synonymous. Local terms used to denote periods of pollution or taboo frequently revolve about the word *hi*. One who is in a state

50 Ōmachi, personal communication. Shinto is usually divided into at least two categories by Western scholars. One, a loose mass of non-Buddhist popular beliefs and practices, is called Popular Shinto or, as the author has used it here, simply Shinto. There are also, however, a number of organized Shinto sects, the beliefs and practices of which are collectively called Sect Shinto. The average person is both Buddhist and a Shintoist (Popular Shinto). If, however, one is a member of an organized Shinto sect, he is seldom also a Buddhist.

51 Embree, 1939, pp. 182-183.

52 Buddhist memorial services.

53 Embree, 1939, p. 219. The discussions of *hiaki* at birth and death may also be found in Embree, 1951, pp. 20 and 23.

54 See Yanagita, 1951, *hiaki* entry. It is also possible to translate *hiaki* as "expiration of days." This translation assumes that a homonym for the *hi* meaning "fire" or "*imi*" is used.

of pollution (and taboo) may be referred to as "covered with fire," "eating fire," or "involved in fire."[55] A person who becomes ill soon after exposure to pollution from a corpse is said to be *hi-make* (defeated by fire) in one village of Tosa Province and *imi-make* (defeated by *imi*) in another.[56] *Hiaki*, as it exists in Suye Mura, appears to indicate or to have formerly indicated the end of a period of pollution and taboo. No mention appears in Embree's work, however, of taboos beyond food restrictions for a woman after childbirth (which appear unrelated to beliefs of *kegare-imi* in both Takashima and Suye) and food taboos during funeral periods (which appear to be the standard, so-called Buddhist restrictions found everywhere in Japan against eating meat or fish during funeral periods or at times of memorial services). No reference is made to menstrual taboos in Suye.[57]

The foregoing is not to maintain that the beliefs and practices herein described exist everywhere in Japan. It is to say that, although long absent or weak in urban areas, they may still be found in fairly elaborate form in numerous communities of rural Japan. The author has no precise information on their existence as household or daily-life practices in urban areas except in a few small cities, where they remain in more or less vestigial form.

These beliefs and practices appear everywhere to be rapidly disappearing. In the community of Takashima, as may be noted, these ancient customs have become considerably altered in form and less strict within the past thirty years or so. In some households of Takashima the practices are observed today only out of respect for aged grandparents who adhere to the old ways. As soon as the members of the present generation of grandparents die, many of the practices die with them. This is particularly true of *imi* practices associated with menstruation and childbirth. Nearly all women of Takashima still observe *imi* against contact with Shinto deities for the stated reason that they would feel "strange" if they were to make offerings or visit shrines during the traditional periods of *kegare*. In any case, as they point out, restrictions of this sort are exceedingly simple; it requires no effort to omit the making of offerings or to avoid going to shrines. Shrine visits by younger women are, moreover, infrequent; most women under advanced middle age may visit shrines two or three times annually.

The very simplicity of many of the taboos which have survived has no doubt contributed to keep their observance alive through the many centuries. Abstentions

55 Kagawa-ken Minzoku Chōsakai, 1950, p. 22; Ōmachi, 1942, p. 32 ff.

56 Ōmachi, 1942, p. 34. Ōmachi also states, "In most cases, *imi* is expressed by the word *hi* (fire) . . ." (personal communication).

57 The taboo prohibiting women from passing through Shinto *torii* during menses appears, however, in a later work (Embree, 1945, p. 186).

such as segregation at childbirth and during menstrual or funeral periods work a hardship on all members of the household and, to some extent, on the community. It is perhaps for this reason that the practice of segregation has very nearly died out. The custom of isolation at death is reported to have gone into decline earlier than practices of isolation during other *kegare*,[58] perhaps because the whole household was involved and suffered serious loss through interruption of work routines. When a lone female of the household was segregated at birth or during menstruation, the household, which usually includes more than one adult female member, would presumably have been able to carry on its routine in normal if somewhat limping fashion.

As is pointed out by Sansom and others, the influence of the old beliefs still remains in Japan, whether urban or rural, in a number of forms. The child-naming ceremony widely observed throughout Japan on the seventh day after birth appears to be a survival of *imi* practices, and formerly[59] to have marked the end of a period or stage of pollution for the mother and child. The common use of *kichū* papers also represents a survival, although they probably carry little meaning today in most urban areas beyond indicating that the household has suffered a death. *Imi* in the sense of purification also survives today in the rural and urban custom of consecrating ground before the erection of buildings, a custom which often involves the use of leafy bamboos. The origin of this practice appears to be in ancient priestly ritual in which sacred bamboos called *imi-dake* (*imi* bamboo) were used in purifying areas to be used in the performance of ritual.[60]

An attempt to describe or appraise the effect of the concepts of pollution and taboo as they exist today in attitudes and in lingering customs no longer immediately identifiable as lineal descendants of *kegare-imi* practices is beyond the scope of this paper and must await further research. It is the belief of the author that a detailed study of this subject may contribute measurably toward shedding light on contemporary Japanese culture. In the words of Ōmachi,[61] ". . . the beliefs and practices of *kegare* and *imi* are one of the most basic and primary subjects [in the study of Japanese culture]."[62]

58 Ōmachi, personal communication.

59 As noted in the foregoing pages, the seven-day period remains a time of pollution and abstinence in a considerable number of rural communities.

60 See Florenz, 1900, p. 32.

61 Personal communication.

62 Additional material relating to our general subject will be found in other works noted in the bibliography but not specifically cited in the text; namely, Aston, 1896; Chamberlain, 1882; Haring, 1946; Ōmachi, 1951; Ōtō, 1949; Satow, 1879; Yanagita, 1938.

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A DAKOTA CONJURING CEREMONY

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AMONG several highly acculturated American Indian groups there appears the tendency for institutions concerned with native medical practices to linger after many basic features of their culture such as economic institutions, material culture, and forms of social organization, such as clans, have virtually disappeared or have been very much modified. A present-day Dakota conjuring ceremony, *Yuwipi*, performed for curing diseases and locating lost or stolen objects, furnishes an example.

Another example can be found in Redfield's account of the medical practices surviving in highly acculturated Tepoztlan.[1] Likewise, the Wisconsin Oneida, though having lost almost all of their aboriginal social and religious institutions, retain a false-face medicine man and use several native herb medicines.[2] Some of the Tiwa and Mexican Indians of Tortugas village, south of Las Cruces, New Mexico, follow certain native medical practices. While it is not the purpose of this paper to explain the long life of native medical customs, an obvious answer is that the services of the modern physician are not yet readily available to all native groups. In addition, even when a physician is available, the medicine man is called upon and is able to effect cures. This seems to be especially true in the case of psychosomatic illness.

The Dakota *Yuwipi* rite is a variant of a ceremony, widespread in northern North America, called the "Conjuring Complex" by Ray[3] and the "Shaking Tent Rite" by Cooper.[4] The rite involves the "calling of spirits" by supernatural means and usually features the shaman demonstrating his prowess and contact with the mystic powers by freeing himself of tightly tied bonds. The Dakota ceremony is basically native in origin although a few Christian elements have been added in recent years by some of the leaders.

1 Robert Redfield, *Tepoztlan, a Mexican Village* (Chicago, 1946), pp. 156-170.

2 Robert E. Ritzenthaler, *The Oneida Indians of Wisconsin* (Bulletin, Public Museum of the City of Milwaukee, vol. 19, no. 1, 1950), pp. 36-39.

3 Verne F. Ray, "Historic Backgrounds of the Conjuring Complex in the Plateau and the Plains" (in L. Spier, ed., *Language, Culture, and Personality: Essays in Memory of Edward Sapir*, pp. 204-216, Menasha, Wis., 1941).

4 John M. Cooper, *The Shaking Tent Rite among Plains and Forest Algonquians* (Primitive Man, vol. 17, pp. 60-84, 1944).

The *Yuwípi* ceremony of the Dakota has been somewhat neglected in the literature, although brief accounts of it, or of similar ceremonies, have been written by several students of Dakota culture. Lynd[5] describes a *Yuwípi* type ceremony of the Yankton, Sisseton, and Mdewakanton Dakota, and Pond[6] describes one for the "Eastern Dakota." Densmore[7] also describes ceremonies of the *Yuwípi* type for the Standing Rock Dakota (Teton and Yanktonai). Macgregor[8] gives a brief account of *Yuwípi* as performed by the Pine Ridge Teton Dakota, and is the only author to describe it under the term *Yuwípi*. He states that it is "the only continuing cult of the old religion." It thus appears that at one time or another all seven divisions of the Dakota tribe have possessed some form of the *Yuwípi* rite, although at present shamans are apparently found only among the members of the Teton division, living on the Pine Ridge and Rosebud Reservations in South Dakota. The Teton Dakota are probably the most conservative of any of the seven divisions of the Dakota tribe at the present time.

Eyewitness accounts of Dakota *Yuwípi* ceremonies have been secured from eight Dakota, one Arikara, one person of mixed Mandan-Hidatsa-White descent, and another of Mandan-Arikara-White descent. Additional details have been secured from several White and Indian informants. By a comparison of these accounts with one another and with those in the literature a fairly complete picture of the Dakota *Yuwípi* ceremony is obtained. It should be realized, however, that there was, and still is, a certain amount of variation in the rite as led by different leaders.

The word *yuwípi* in the Dakota language apparently means "wrapped." It is not listed by Riggs in his *Dakota-English Dictionary*,[9] but the verb *yuwí*, meaning "to wrap" is listed by Williamson in his *English-Dakota Dictionary*."[10] It ostensibly refers to the wrapping and binding of the *wapíye*, or shaman, in a blanket.

The ceremony is given to locate lost or stolen objects and to cure the sick.

5 J. W. Lynd, *The Religion of the Dakotas* (Collections, Minnesota Historical Society, vol. 2, pp. 150-174, 1889), pp. 158-159.

6 Gideon Pond, *Dakota Superstitions* (Collections, Minnesota Historical Society, vol. 2, pp. 215-255, 1889), pp. 249-250.

7 Frances Densmore, *Teton Sioux Music* (Bulletin, Bureau of American Ethnology, no. 61, 1918), pp. 217-218, 246.

8 Gordon Macgregor, *Warriors Without Weapons* (Chicago, 1946), pp. 98-99.

9 Stephen R. Riggs, *A Dakota-English Dictionary* (Contributions to American Ethnology, vol. 7, U. S. Geographical and Geological Survey of the Rocky Mountain Region, Washington, 1890).

10 John P. Williamson, *An English-Dakota Dictionary* [etc.] (Pioneer Press: Yankton, South Dakota, 1902), p. 263.

It is of a somewhat secret nature, and unbelievers and strangers are not welcomed.[11] Those who are allowed to observe the ceremony are warned against skepticism. If a person wished the *Yuwípi* ceremony to be performed, it was formerly the custom to approach the *wapíye* with a pipe. If this pipe were accepted and smoked, a feast was prepared as the preliminary to the ceremonial.[12] At the present time the use of the pipe is sometimes dispensed with. It is the custom after the rite to give presents to the *wapíye* for his services. Little Warrior was given a horse, food, and clothing after a performance he led at Pine Ridge about ten years ago. Albert Six Feathers, a Dakota from Martin, South Dakota, stated that "after four nights" a horse would be the proper fee for a *wapíye's* services.[13] This may indicate that the ceremony is customarily performed in cycles of four as is sometimes the case in peyote doctoring.

The *Yuwípi* ceremony is always held in a dark place, i.e. a dwelling with all the windows and cracks covered. Formerly a tipi was commonly used. No wires, ropes, or cords are permitted except those to be used in the ceremony. Rawhide ropes are preferred for binding the shaman. Several hundred bags of tobacco are strung together, going around the inside of the house in front of the spectators, who are seated next to the wall.[14] The men sit cross-legged on the floor; the position of the women is not important.

There are four flags or "drapes," one in each corner of the room. These are colored red, white, yellow and black. Wallace Walking Bull, a Dakota informant from White River, South Dakota, stated that they represent the four winds (directions). Thomas Goodall, an Arikara, stated, however, that a Dakota leader had informed him that they represented "the four great races of mankind": the American Indian, Caucasian, Mongolian, and Negro. The latter interpretation may be an individual variant received in a dream by the Dakota leader. Flags were not used in all of the ceremonies described to the authors.

Walking Bull mentioned an altar or "sacred place" of yellow sand, encircled

11 Young people were discouraged from attending a ceremony sponsored by the Mandan and Hidatsa at Elbowoods, North Dakota, and led by a visiting Dakota *wapíye* from Rapid City, South Dakota. In spite of this warning several youths, including two of the authors' informants, attended.

12 At a recent ceremony held at Pine Ridge a *wapíye* demanded a dog meat feast before the rite, a request which was fulfilled.

13 Ray Schulenberg, Bismarck, North Dakota, personal communication.

14 According to Walking Bull, the sacks numbered six or seven hundred, but Albert Six Feathers gave the number as four or five hundred (Ray Shulenberg, personal communication). Black Elk, another Dakota informant (not the famous shaman of the same name who is the subject of Neihardt's book), stated that five hundred were used at a recent rite held near Pine Ridge, South Dakota.

by a line of "smokes," but this feature is not mentioned by other informants nor in the literature. The *wapíye* draws the face of the "spirit" on this sand in small dots, according to this informant. On each side of this altar are "nests" of sage in which two *wagmúha* or sacred gourd rattles are placed. The *wapíye* has a bed of sage on which to lie. Gifts to the spirits, which disappear during

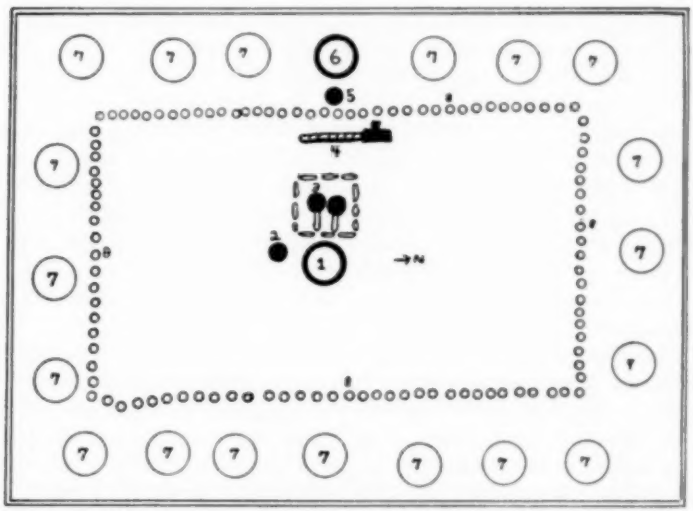

FIG. 1. The Yuwípi ceremony of Little Warrior (Kyle, South Dakota, 1940). 1, Shaman (wapíye); 2, medicine bag of wapíye; 3, rattles; 4, calumet pipe; 5, helper's drum; 6, helper; 7, members of audience; 8, tobacco pouches.

the ceremony, are placed about this area.[15] Four singers are seated in one corner. They accompany their singing with small hand drums.

Little Warrior, of Kyle, South Dakota, used a variation of this arrangement at a ceremony which he led in 1940. He sat in the center of a room facing westward toward a single assistant who sat beside the wall. The assistant placed a drum in front of his feet and further forward a calumet pipe oriented north and south. Little Warrior placed his medicine bag to his left and built a small altar in front of his feet. First he made a square border of a series of small sticks

15 Macgregor, *Warriors Without Weapons*, p. 99. These gifts may be identical with the "smokes" mentioned by Walking Bull, i.e. gifts of tobacco.

about the size of clothes-pins. The center of this altar was filled with a matting of sage brush twigs. On the matting were placed two rattles with their handles toward Little Warrior.

First the *wapíye* makes a speech, telling the reason for holding the ceremony and asking that everyone present concentrate on this purpose. He warns unbelievers that their presence may bring evil consequences. No one may leave once the ceremony has begun. According to Six Feathers, during this speech the *wapíye* acknowledges his inferiority to Christ.

The *wapíye* is then wrapped in a blanket, quilt, or a piece of canvas and thoroughly bound in several feet of rawhide or hemp rope.[16] All accounts of the ceremony describe the thoroughness with which this binding is done. Some accounts mention that even the individual fingers and toes are bound together.

The leader then sings songs addressed to the spirits, and perhaps his own dream songs as well. He calls to the spirits for assistance in achieving the desired purpose of the ceremony. Ceremonial "crying" of the type which occurs in the Sun Dance and during ritual fasting also occurs here. The *wapíye* is then laid, face down, upon the bed of sage. At this point all of the lights in the cabin are extinguished.

The four assistants then begin to sing, accompanying themselves with hand drums. The songs used are called *wakán olówan* (spirit songs) and are known to only a few individuals. With the first song, ideally, small blue or green lights resembling electric sparks appear. These lights are said to be caused by *inyan waśicu*, or holy stones, knocking together.[17] These stones, small, usually round rocks, are considered to be the embodiments of spirits. Although they are termed *inyan waśicu* generically, they all seem to have specific names. These stones enter the room, often by way of the stovepipe, and fly about. Sometimes each one falls to the floor in turn with a heavy thud, thus enabling the spectators to count their number.

Next, the gourd rattles are heard to stand up in their "nests" and dance, and soon are dancing about the room. They keep strict time with the drums all the while. Sometimes the drums are levitated as well, and continue beating from up near the ceiling. According to Six Feathers and his wife this portion of the ceremony may last an hour or more, depending upon the seriousness of the

16 According to Six Feathers this quilt has stars and "half moons" (crescents?) upon it.

17 According to Densmore the beliefs concerning the power of sacred stones are a widespread feature of Dakota religion. They are connected with the Dakota god *Tákuškánškán* (something that moves) and are one of the objects frequently dreamed of in the vision quest (Densmore, *Teton Sioux Music*, pp. 204-218).

occasion. Six Feathers stated that the "spirits" bring the gourd rattles and rub them on the body of the sick person, thereby removing the pain from the afflicted part.

The spirits, as manifested by the flying sparks or stones, are addressed by the *wapíye,* who calls them by the ceremonial term *tunkáśila,* or grandfather. He asks, if the meeting has been given for a sick person, what the cause of the disease is, and where a medicine for it may be found. If the ceremony is being given to recover a lost or stolen object, he asks where this object is. The spirits reveal this desired information to the *wapíye* in an archaic, rapid, speech, which is incomprehensible to anyone else.

Sometimes persons other than the *wapíye* receive advice from the spirits. If this occurs the *wapíye* informs the person to be so visited beforehand, and this person then offers tobacco to the spirit. A Hidatsa woman reported having been visited by the spirit of her deceased sister during this portion of the ceremony.

After this episode the lights are again put on. The *wapíye,* who was so tightly bound, is now seen to be standing in the center of the floor, completely free of his bonds, which have supposedly been untied by the spirits in the darkness.[18] The ropes which bound him and the blanket in which he was wrapped are neatly rolled into tight balls. The knots have not been untied.

The *wapíye* then reveals what the spirits have told him, either concerning the nature of the ill person's disease and where to find the correct medicine, or the location of a lost or stolen object.[19] If the spirits have visited some of the spectators, they also tell what they have learned at this point. In some cases one of the small round "spirit stones" remains with the *wapíye* and is given to the sick person to carry home with him. This stone predicts coming events for the owner. In certain instances herbs may be given to the sick person.

According to Six Feathers a pipe is passed around after the lights are put on again, but Walking Bull states that this is done only in meetings led by older leaders, and that younger *wapíye* do not require this feature.

At the close of the meeting food is eaten after having been blessed by the *wapíye.* This feast consists of dog, wild peppermint tea, and "fry bread," with possibly other foods, such as wild cherry pudding, added occasionally. The dog used is painted with *wasé,* or native paint, from the tip of its nose to the end of

18 According to Densmore the *wapíye* was found hanging from the top of the tipi by one foot (Densmore, *Teton Sioux Music,* p. 346). The Long Lance (Blackfoot) version describes a similar occurrence (Chief Buffalo Child Long Lance [Sylvester Long], *Long Lance,* New York, 1928, p. 57).

19 According to Macgregor, the recounting of things learned takes place before the lamps are relighted (*Warriors Without Weapons,* p. 99).

its tail. It must be killed by being strangled with a rope pulled around its neck. Its mouth is tied shut to keep it from howling. The hair is singed off and the meat cut up and boiled. The head, tail, and feet are not used. Of the entrails only the liver is eaten.

Macgregor[20] states that an older member of the *Yuwipi* cult mentioned that the worshippers believed in the

> Sun and the Daylight—that is Wakan, our god (the chief god). Then we worship Darkness (the creator god); that is why we sit in darkness in the tepee at a Yuwipi ceremony. The women think of sexual things and later they go home with their men. That is creative; that is not bad; the Darkness is holy. Then, there is a rock (the executive god). The leaders have a little bundle of sticks in their hand when they are tied up and a blanket is thrown over them. The rocks make sparks and lightning shoots all over the tepee. The Rock is hard and steadfast and that is what our faith must be. It is like the earth. Then there is Wakinyan or Heyoka (an associate god). It flashes through the sky, and storms come, and strong winds, and floods that wash away the soil. The Yuwipi people say that it is cleansing them and cleansing the earth. Wakan washes away everything and makes everything clean and new.

As noted above there is a certain sexual element in the *Yuwipi* ceremony. Black Elk, the famous medicine man (the subject of Neihardt's book *Black Elk Speaks*) is said to have been a *wapiye* famous for making "love medicine" in the *Yuwipi* ceremonial.[21]

According to Walking Bull, not all *Yuwipi* men unbind themselves in the darkness. Some have a committee which does this afterwards. This seems to indicate that the prowess of the *wapiye* in divesting himself of his bonds is merely a secondary feature of the Dakota rite, the calling of the spirits being the prime feature. Sometimes this calling of the spirits is not successful.

Sometimes children may be allowed to attend the ceremony. No person with a contagious disease is permitted inside. No dogs are allowed. Persons who are skeptical are not welcomed. A *wapiye* is said to know exactly who is sincere and who is not. Once a *wapiye* knew that a certain man had to urinate and told him that he should not have come in. In another case a *wapiye,* bound within a darkened tipi, informed a youth who was peeping under the edge of the tipi covering that he was aware of the youth's presence and that he must leave.[22] At Kyle, South Dakota, during a ceremony, Little Warrior freed himself of his bonds and while the room was still darkened, threw the blanket upon a skeptical

20 *Ibid.*

21 George Metcalf, Lincoln, Nebraska, personal communication.

22 Frank Fiske, Fort Yates, North Dakota, personal communication.

visitor. This person later stated that this had nearly frightened him to death. At another rite held near Pine Ridge, South Dakota, the *wapíye* halted the ceremony and stated that they would have to close it for a devil was coming. In a few minutes a car-load of drunken Indians arrived, confirming the shaman's prediction.

Leonard Eagle, a youth of Mandan-Hidatsa and White descent, described attending a ceremony with a group of young men who were quite skeptical. When the gourds began flying about the room one paused, rattling loudly, before one of Eagle's companions. The companion asked him, "Should I hit it?" whereupon he struck the gourd with his fist. The gourd flew to the other side of the room, only to return and strike the youth several times around the face. "It really raised hell with him!" commented Eagle.

According to the older custom a man received instructions for becoming a *Yuwípi* leader in a vision. Thomas Goodall, an Arikara, stated that Black Thunder, a famous Dakota *wapíye*, had received his power and the directions for running a *Yuwípi* ceremony only after a long period of fasting in the hills. Densmore[23] records a shaman of the *Yuwípi* type receiving power after falling from his horse head first into a pile of stones. The man was unconscious for nearly an entire day. Upon recovering he announced that all rocks and stones were "people turned to stone."

Apparently a vision is not necessary at the present time. Black Elk, a Pine Ridge informant, claims that several of the present-day shamans have dispensed with these preliminaries. Walking Bull also stated that at present anyone who desired to practice the *Yuwípi* rite might do so. Although the position of the *wapíye* was not hereditary, apparently there is a tendency for a member of the same family to supplant a shaman at his death. After Little Warrior died at Kyle about a year ago, his son-in-law, White Wing, went on a vision quest and then took his place as the local *wapíye*.

Apparently requests were sometimes made of the sacred stones, as Densmore notes that Sitting Bull, the Hunkpapa leader, offered a bison robe to the stones and asked to be made famous.[24]

According to George Metcalf, the Dakota believe that the use of the *Yuwípi* rite is dangerous to the *wapíye*. He states that the feeling is "Every time the power is used, the less the defense of the *wapíye* against this power." Bill Ginais, a mixed-blood Teton, gave up the practice because he considered it too dangerous.

23 Densmore, *Teton Sioux Music*, p. 217.
24 *Idem*, p. 218.

Most of the *Yuwípi* men now practicing come from either the Pine Ridge or Rosebud reservations in South Dakota. These are the two most conservative of all the Dakota reservations. Well-known leaders are often called to distant reservations to conduct the ceremony. There are several *wapíye* still practicing, with a concentration around Kyle, South Dakota. Since some of the practitioners are young and middle-aged men, the institution seems destined to survive for some time. Furthermore, some of the younger Dakota still have the ceremony performed for sickness and the recovery of lost articles. A young Dakota girl had the ceremony performed for her sick mother near Pine Ridge in 1940. A Dakota college student stated that he believes the institution will survive for quite a while because it is a profitable business for the practitioners and he has heard of several Dakota who are planning to become *wapíye* for mercenary reasons. Another Dakota college student stated that if the Whites have the Christian Science religion, why be surprised when some of the Dakota have their *Yuwípi*, especially when cures are effected.

There is apparently no conflict in the mind of the *wapíye* himself, or his audience, between the practice of the ceremony and the following of the Christian religion. Three examples of men being *Yuwípi* leaders while at the same time maintaining membership in the Roman Catholic church are reported. Two of the men were ordered to stop on the penalty of excommunication, while the other was whipped with a quirt for practicing the rite.

If the *Yuwípi* ceremony, as now practiced by the Dakota, is compared with the tent-shaking complex of the northern Algonquin tribes as described by Ray, Cooper, Flannery,[25] and others, it is noted that the Dakota lack a fundamental trait, the shaking of the tent when the spirits enter. Several other western tribes also lack this element in their conjuring ceremonies, for example the Colville of Washington and the Mandan of North Dakota.[26] Yet Pond[27] mentions the tent-shaking trait in a *Yuwípi* type ceremony of the Eastern Dakota. As the *Yuwípi* ceremony is now often held in a house rather than a tent, it is possible that we have here the reason for the absence of this trait. Ray[28] has mentioned this possibility in explaining the lack of tent-shaking among the Colville. Since the Mandan usually lived in substantial earthlodges except when on the hunt, their type of architecture could well explain the absence of the same trait.

25 Ray, *Historic Backgrounds of the Conjuring Complex;* Cooper, *The Shaking Tent Rite;* Regina Flannery, *The Gros Ventre Shaking Tent* (Primitive Man, vol. 17, pp. 54-59, 1944).

26 Ray, *op. cit.*, pp. 208-209; Alfred W. Bowers, *Mandan Social and Ceremonial Organization* (Chicago, 1950), pp. 179-180.

27 Pond, *Dakota Superstitions*, pp. 249-250.

28 Ray, *op. cit.*, pp. 208-209.

The binding of the shaman, another basic and widespread element of the tent-shaking complex is found among the Dakota. This trait is found among a large number of Plains, Plateau, and Woodland tribes, such as the Cheyenne, Blackfoot, Assiniboin, Plains Cree, Atsina, Kutenai, Cree, Ojibwa, Montagnais, and Naskapi.[29] It is also found among the Central Eskimo.[30] Cooper[31] has outlined the traits of two contrasting tent-shaking complexes. In the western division the Dakota share with the Atsina, the Blackfoot, and the Assiniboin, the "Houdini" trick (loosening of bonds) and the dog-feast. The Dakota share with the eastern division—including the Cree, Ojibwa, and Montagnais—the "calling of spirits" rather than the invoking of human ghosts. Collier[32] has noted that the Kiowa also invoke the dead rather than supernatural or animal spirits.

The Dakota share the following traits with both of the tent-shaking complexes described by Cooper: no trance or ecstasy by the performer, and performers not of psychopathic personality as such; spirits summoned primarily to obtain knowledge through them, chiefly knowledge on practical problems; absence of direct participation of Supreme Being in rite; rite as such concerned with personal beings, not with impersonal forces, and thus a religious, not a magical rite.[33]

Some of the other features of the *Yuwípi* are shared by one or more tribes. Thus conjuring is practiced for curing among the Ojibwa of Minnesota, the Mandan, the Atsina, and the Ojibwa of Parry Island.[34] The Assiniboin and the Atsina, as did the Dakota, wrapped the shaman in a blanket. The obtaining of power by vision is found among the Parry Island Ojibwa and the Mandan.[35]

Although a detailed tribe by tribe distribution study of the traits connected with the tent-shaking complex has not been made, the *Yuwípi* rite of the Dakota

29 George Bird Grinnell, *The Cheyenne Indians, Their History and Ways of Life* (2 vols., New Haven, 1923), pp. 112-117; Long Lance, *Long Lance*, pp. 51-57; Robert H. Lowie, *The Assiniboine* (Anthropological Papers, American Museum of Natural History, vol. 4, pt. 1, 1909), p. 49; Donald Collier, *Conjuring Among the Kiowa* (Primitive Man, vol. 17, pp. 45-49, 1944), p. 49; Flannery, *The Gros Ventre Shaking Tent*, p. 55; Ray, *Historic Backgrounds of the Conjuring Complex*, p. 207; Prince Maximilian von Wied-Neu-Wied, "Travels in the Interior of North America, 1832-34" (in Reuben Gold Thwaites, ed., *Early Western Travels, 1748-1846*, vol. 23, Cleveland, 1906), pp. 200-201; Frances Densmore, *Chippewa Customs* (Bulletin, Bureau of American Ethnology, no. 86, 1929), pp. 45-46; Diamond Jenness, *The Indians of Canada* (Bulletin, National Museum of Canada, no. 65, Ottawa, 1932), p. 273.

30 Franz Boas, *The Central Eskimo* (Sixth Annual Report, Bureau of American Ethnology, 1888), pp. 593-594.

31 Cooper, *The Shaking Tent Rite*, p. 81.

32 Collier, *Conjuring Among the Kiowa*, p. 49.

33 Cooper, *The Shaking Tent Rite*, p. 81.

34 Ray, *Historic Backgrounds of the Conjuring Complex*, pp. 205-206; Bowers, *Mandan Social and Ceremonial Organization*, p. 180; Flannery, *The Gros Ventre Shaking Tent*, pp. 55-56.

35 Ray, *op. cit.*, p. 211; Bowers, *op. cit.*, pp. 179-180.

appears to be close to an intermediate position between the Plains tribes such as the Atsina, Blackfoot, and Cheyenne, and the northern Woodland peoples such as the Cree, Ojibwa, and Montagnais. Such a conclusion should be no cause for surprise considering the intermediate geographic position of the Dakota.

In summary, it is observed that the present-day *Yuwípi* ceremony of the Dakota is an example of a widespread conjuring complex of the Plains, Woodland, and Plateau areas, commonly referred to as the "shaking-tent rite." As practiced in recent years it differs from the classic complex in the lack of the tent-shaking trait. Among the Dakota the conjuring ritual is performed for curing illness and the finding of lost and stolen articles. If a comparison is made of the traits in the Dakota rite and those of the Plains and northern Algonquin complexes described by Cooper, it is noted that the Dakota *Yuwípi* ceremony occupies an intermediate position. The *Yuwípi* ceremony has continued to the present among the Teton Dakota. Since participants in the ritual still include younger and middle-aged Indians it seems likely to continue for some time. Several reasons may explain its survival. Many Dakota are still not convinced that our medical practitioners are capable of curing all types of disease, while to others physicians are not readily available. In certain instances cures are reported by *Yuwípi* leaders. This may be particularly true in the case of psychosomatic illnesses. Although not confirmed by the majority of native informants, certain of the *wapíye* apparently continue their practice purely for mercenary reasons.

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THE BLOWGUN IN THE NEW WORLD

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THE BLOWGUN is one of those items of material culture that has led to considerable speculation by Americanists. The implement, with the complex of traits that surround it (darts, quivers, poison, etc.), has a wide, though discontinuous, distribution in the New World. It is found in the tropical forest areas of South America, in Central America and southern Mexico, and in the eastern United States. The blowgun has a somewhat complementary range in southeastern Asia where it extends from the Malay Peninsula to the Philippines.

As used by the American Indians, the blowgun exists in a number of structural types. Basically, however, the gun is a hollow tube of cane or wood, usually several feet in length. A dart, wrapped at the proximal end with a wad of cotton, is introduced into one end of the tube, the cotton acting as a piston-gasket. The user then expels the dart by blowing sharply into this end of the tube. The projectile leaves the gun with considerable speed and is effective for killing small game. In one area (Central American and Mexico) a pellet of clay replaces the dart as projectile; the principle, however, remains the same.

In this paper we will deal with the distribution of the blowgun in America and with a series of peripheral problems that grow out of such a study. This includes not only examination of the place and time of origin(s) and routes of diffusion of the blowgun but also a discussion of the processes involved in differentiation, elaboration, and diffusion of the implement in the several "sub-areas" in South, Central, and North America. Blowgun distribution will be tabulated at two time levels: the Conquest period and the present day. This lends historical depth to the considerations of distribution that follow.

The problem of blowgun diffusion in the New World has been the subject of a number of articles in the past. The first important consideration of this problem came in 1911 when Friederici presented a distribution map of the blowgun. He listed the implement in an area from the upper Paraguay River and the southern Brazilian coast of South America northward to the Valley of Mexico. The blowgun is not noted, however, from the Peruvian and Ecuadorian coasts and the interior of eastern Brazil. In North America, Friederici shows another blowgun area in the eastern United States, primarily the Southeast culture area with an extension northward into the Eastern Woodlands.

Friederici noted several types of blowgun. For North America he described a simple tube with dart projectile. In the Central American area the projectile was recorded as a pellet rather than a dart. Two main types of blowgun were listed for South America: (1) the Guayana type, northeastern in areal occurrence and made of a small tube fitted into a protective sheath; and (2) the Amazon gun, in the upper Amazon and Montaña, manufactured by fitting together (face to face) two half-tubes, each having a longitudinal channel on its matching face. Between these two areas is an "intermediate type" where the outer tube of a sheathed or two-tube gun is made of bound halves. All of the South American types use a dart as projectile.[1]

Friederici unfortunately overextended the area of blowgun distribution. His listing of the weapon among the Tupian tribes of the Brazilian coast depended on a doubtful interpretation of a single word in one early report (see below).

Of less importance than the work of Friederici is the culture diffusion paper of Schmidt. This ethnologist, in 1913, listed the range of the blowgun and other weapons in South America. He made no attempt to plot separate types and the listing is very incomplete, ignoring most of the northern edge of the South American blowgun area.[2]

Rivet has suggested the blowgun as one of a series of "proofs" of Malayo-Polynesian contact with America. This contention, however, was not supported by any practical demonstration of the ways and means of this hypothetical connection across the Pacific.[3]

One of the most complete surveys of blowgun distribution in South America was the study of Nordenskiöld. Nordenskiöld noted the importance of suitable material as a factor in distribution of the implement. Like Friederici, he isolated two main blowgun types (in South America), each with its peculiar distribution. One of these, a two-tube gun of *Arundinaria* reed, is northern and eastern; the other, a split-half composite weapon of chonta palm, occurs in the western part of the South American blowgun area. He also noted a simple blowgun, found in the upper Madeira drainage, and a two-tube composite gun in the watershed between the Uaupés and Japura Rivers, northwest tributaries of the Negro and Amazon. In the light of this distributional data he saw the main geographical spread of the blowgun as post-Columbian. In regard to this point he suggested

1 Georg Friederici, *Die Geographische Verbreitung des Blasrohrs in Amerika* (Petermanns Mitteilungen, vol. 45, pp. 71-73, Gotha, 1911).

2 Wilhelm Schmidt, *Kulturkreise und Kulturschichten in Südamerika* (Zeitschrift für Ethnologie, vol. 45, pp. 1014-1030, Berlin, 1913).

3 Paul Rivet, *Les Malays-Polynésiens en Amérique* (Journal de la Société des Américanistes de Paris, vol. 18, pp. 141-278, 1926).

that the wide-spread diffusion of the gun depends on availability of curare poison and this poison—according to Nordenskiöld—became generally utilized only in post-Conquest times.[4]

A report on the blowgun collection in the Museum of Ethnology, Soviet Academy of Science, was given by Sprinzin in 1928. Sprinzin explored the possibility of culture contacts between Indonesia and the New World. The Indonesian blowguns in the Museum were mainly of the two-tube type with considerable variation in size, type of projectile, and construction material. Sprinzin pointed out the inter-hemispherical similarity, not only of the gun but also of a series of other traits, *viz.* wadding for the dart, poison, and the use of the blowgun in hunting small game.[5] It is interesting to note that most of the traits in Sprinzin's "complex" are inherent in any use of the blowgun and cannot be used, *per se*, as evidence of historical connection. This point will be discussed at some length below.

Not all the writers who see the origin of the American blowgun in Asia consider the diffusion of the gun to the New World to be pre-Columbian. The possibility of post-Columbian introduction has been suggested, most recently (in 1938) by Stirling. In his study of the Jívaro Indians, Stirling noted that this group did not seem to have the blowgun in the 16th century. In an investigation of early sources, Stirling found:

> The only instrument at all comparable which is mentioned in the sixteenth century is the pea-shooter or pellet gun of Mexico and Central America. This simple device, which was little more than a toy for shooting small birds, is a far cry from the elaborately manufactured, complex blowgun, shooting long-range piercing darts made effective by the use of poison.

The first reference to this "true blowgun" found by Stirling is in Saabedra (1620), who describes the weapon among the Mainas. Stirling then remarked on the parallel between the blowgun and its accessories in Indonesia and in South America. This complex, in the opinion of Stirling, probably did not develop independently in the two areas, and he suggests that the Indonesian dart blowgun was introduced into America after the Conquest, perhaps by Philippine natives carried on Spanish galleons.[6]

4 Erland Nordenskiold, *The Ethnography of South America, as seen from Mojos in Bolivia* (Comparative Ethnographic Studies, no. 3, Göteborg, 1924), p. 62.

5 Noemie G. Sprinzin, *The Blowgun in America, Indonesia, and Oceania* (Proceedings, 23rd International Congress of Americanists, pp. 699-704, New York, 1930).

6 Matthew M. Stirling, *Historical and Ethnographical Material on the Jivaro Indians* (Bulletin, Bureau of American Ethnology, no. 117, 1938), pp. 80-81.

Aside for considerations of the "specialized complex," it should be pointed out that Stirling's conclusions are based on insufficient examination of the early sources. As will be shown later, sources from the very beginnings of the Conquest period mention the blowgun in South America.

The relations of South American and North American blowguns have also been considered in historic perspective. Two recent papers deal, in part, with blowgun distribution in North America. Speck, writing in the late 'thirties, listed the implement for a number of Southeastern tribes. Most of this paper is concerned with the blowgun in one specific group (the Catawba) but Speck also conjectured the origin of the weapon. The Southeastern blowgun is, with one or two exceptions, a simple, one-tube gun. Speck suggested that this blowgun might easily have been the subject of a separate invention in the Southeast. However, listing a group of similar traits that surround the blowgun in both areas, he postulated possible diffusion from South America to North America.[7]

Swanton, in his general Southeastern ethnology (1946), mentioned the blowgun for a number of tribes and gave a lengthy description of the manufacture of a Creek blowgun. His record was purely descriptive however; Swanton made no attempt to fix the origin of the implement.[8]

Métraux's summary on weapons in the *Handbook of South American Indians* dealt briefly with blowgun distribution. This material followed the study of Nordenskiöld, which has been summarized above.[9]

The latest treatment of the South American blowgun is the regional distribution paper of Yde. This was an attempt to chart the place of origin of the blowgun, the paths of diffusion, and the structural changes made at various times. Yde considered that the simple blowgun with pellets for ammunition was the original type. The Maya-Mexican pellet gun and the sporadic occurrences of simple tube blowgun in South America are survivals of this. Yde believed that the original home of this prototype blowgun was Colombia.

A second type of blowgun (in Yde's scheme) was developed in the northeast part of the blowgun area, presumably from a single-tube prototype. In this region (the Orinoco drainage) the *Arundinaria* reed is an excellent material for blowgun

7 Frank G. Speck, *The Cane Blowgun in Catawba and Southeastern Ethnology* (American Anthropologist, n.s., vol. 40, pp. 198-204, 1938).

8 John Swanton, *The Indians of the Southeastern United States* (Bulletin, Bureau of American Ethnology, no. 137, 1946), pp. 585-586.

9 Alfred Métraux, "Weapons" (in *Handbook of South American Indians*, J. H. Steward, ed., Bulletin, Bureau of American Ethnology, no. 143, 6 vols.: vol. 5, pp. 229-263, 1949), pp. 248-252.

construction, growing ten to twelve feet between nodes. In order to overcome the brittleness of the *Arundinaria,* the reed was inserted into a sheath of *Paxiuba.*

The next type, in the temporal reconstruction of Yde, was used in the Uaupés-Japura area. There, *Arundinaria* reeds were imported from the Orinoco, but the outer sheath was made of a stem (unidentified) which necessitated splitting in order to insert the inner reed.

The blowgun then diffused westward, and in the west the inner tube of the gun was discarded as the split halves alone proved satisfactory. In this region the hard chonta palm was especially suited to the manufacture of split halves, providing a channeled blowgun which came to be widely used.

Yde considered these stages of blowgun development a strict chronological sequence and in addition believed that all but the first type spread in post-Conquest times. In this he reiterated Nordenskiöld's belief that blowgun spread depended on curare—a relatively late development.[10]

Yde's paper will be discussed more fully in a concluding section. His theories, though stimulating, suffer from a number of factual errors, and these seriously influence the validity of his conclusions.

The historical connection of the blowguns of Central and South America, as suggested by Yde, is quite probable. We will find, however, that parallel development rather than an evolutionary sequence produced the separate blowgun types in South America.

Yde mentions the North American (Southeast and Eastern Woodlands) occurrence of the blowgun only briefly and then only to suggest that it was due to "culture emanations" from Mexico at an early period. This is a possibility, but, as will be developed later, it is more likely that the North American blowgun originated independently, or at least was diffused to the Southeast in very recent times.

Before drawing conclusions however, it seems necessary to examine the whole blowgun data *de novo.* Finally, it will be desirable to examine some general applications of the blowgun study where we will be concerned with the concepts of invention and parallelism of culture traits, and with the application of the blowgun distribution study to the general culture history of the New World.

BLOWGUN DISTRIBUTION IN PRE-CONQUEST AND CONQUEST TIMES

Pre-Conquest blowguns are reported from coastal Peru and from southern and central Mexico. At Conquest times the blowgun extended from northern Bolivia

10 Jens Yde, *The Regional Distribution of South American Blowgun Types* (Journal de la Société des Américanistes de Paris, vol. 37, pp. 275-317, 1948), pp. 302, 310.

to central Mexico in a discontinuous distribution, so far as present knowledge goes. There were two separate areas, each with a particular type of blowgun. In South America the implement was concentrated in the central and northern Andes and in the Montaña to the east. The projectile was a dart, and poison of an unknown type was reported for this entire area.

There are no early reports for the blowgun in the lower Amazon, the Negro, and the Orinoco River drainages. It must be remembered, however, that there are few early records for these areas. Most of the accounts that do exist are of rapid trips and contain little information. There is one mention, by a German traveler, Hans Stade, of a possible blowgun used by the Tupinamba of the Brazilian coast as of *c.* 1550. Stade's account mentions a war weapon which is referred to only as *roren* (tube). This has been taken to mean blowgun, but a more general meaning of *roren* in the German of Stade's day was a powder-and-ball implement. Stade was probably speaking of a trade firearm.[11]

In Central America, south of Guatemala, there seem to be no clear cut reports of the blowgun in the early period. It is clear, however, that in later times the South American type diffused into Panama and the Maya-Mexico gun into Honduras and Nicaragua.

The Maya and Mexican blowgun of the early records was probably a simple hollowed-out tube. A pellet of clay was used for the projectile. The blowgun had a reasonable antiquity in this area. It was shared by most or all the southern Maya-speaking peoples at the Conquest, and in the Valley of Mexico was used at Teotihuacan, perhaps by 500 AD.

In spite of occasional assertions to the contrary, the blowgun probably was not found in the Antilles at the time of the Conquest.

The following list records the blowgun of the Pre-Conquest and Conquest periods. The number with each entry refers to the corresponding number on the map (Fig. 1). Dates are of the year the blowgun was first noted or recorded by European observers, or, in the case of pre-historic horizons, refer to the estimated time of the particular culture.[12]

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11 Hans Stade, *The Captivity of Hans Stade of Hesse* (Albert Tootal, tr., Publications, Hakluyt Society, vol. 51, London, 1874), p. 55.

12 In the listings of blowgun use that follow, sources will be cited only of cases not recorded in previous surveys. For uncited occurrences of the blowgun at Conquest times and in modern South America see: Nordenskiöld, *Ethnography of South America as seen from Mojos*, pp. 80-85; Yde, *Regional Distribution*, p. 277; for North America: Speck, *Catawba Blowgun*, pp. 198-204; Swanton, *Indians of the Southeastern United States*, pp. 585-586. All cases listed here from these surveys have been checked against original sources.

FIG. 1. The blowgun distribution at Conquest times and earlier. Circles, prehistoric blowgun; unmarked, blowgun at Conquest times. Numbers 1-15, South American dart-using blowgun; 16-44, Maya-Mexican pellet-using blowgun.

1–2 Mochica, North Peru (*c.* 500 AD)[13]
3 Coastal Peru (pre-Conquest)[14]
4 Pachacamac, Central Peruvian Coast (pre-Conquest)
5 South Coastal Peru (prob. pre-1000 AD)
6 Atrato Valley, Colombia (1541)
7 Cauca Valley, Colombia (1550)
8 Magdalena Valley, Colombia (1599)
9 Santa Marta, Colombia (*c.* 1600)
10 Lower Magdalena Valley (*c.* 1600)
11 Lake Maracaibo area (*c.* 1600)
12 Beni River area, Bolivia (1567)
13–14 Mainas, Peruvian Montaña (1619-1661)
15 Upper Amazon River (1639)
16 Quiché Maya (1550, recorded from pre-Conquest oral traditions)[15]
17 Cakchiquel Maya (1650)[16]
18–22 Yucatan Maya (1550-1600)[17]
23 Vera Paz area (*c.* 1600)[18]
24 Cholti Maya (1625)[19]
25 Teotihuacan, Central Mexico (*c.* 500 AD)[20]
26 Zapotec area, South Mexico (*c.* 1450-1500)[21]

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13 B. Wassermann-San Blas, *Ceramicas del antigua Perú* (Buenos Aires, 1938), p. 274; Rafael Larco Hoyle, *Los Mochicas* (Buenos Aires, 1945), p. 8; Rafael Larco Hoyle, personal correspondence.

14 Peabody Museum, Harvard University, personal correspondence.

15 Fr. Francisco Ximénez, *Historia de la Provincia de San Vicente de Chiapa y Guatemala* (Biblioteca Goathemala, vol. 1, Guatemala, 1929), pp. 11-16.

16 Fr. Tomás Coto, *Vocabulario de la lengua Cakchiquel* (ms., mid-17th century), f. 35.

17 Ralph L. Roys, *The Book of Chilam Balam of Chumayel* (Publication, Carnegie Institute of Washington, no. 438, 1933), pp. 20, 79; Diego de Landa, *Yucatan Before and After the Conquest* (William Gates, tr., Publication, The Maya Society, no. 20, Baltimore, 1937), p. 94; Hernando de Bracamonte, *Relación de Tiquite* (Colección de documentos de Ultramar, 25 vols.: vol. 11, Madrid, 1885-1928), p. 110; Antonio de Ciudad Real, *Diccionario de Motul*, and Fr. Juan Coronel, *Arte de lengua Maya* (Merida, 1929), p. 287.

18 Antonio de Herrera, *General History of America* (John Stevens, tr., 5 vols., London, 1726), vol. 4, p. 204.

19 Pedro Morán, *Diccionario en lengua Cholti* (Publication, The Maya Society, no. 9, Baltimore, 1935), p. 21.

20 S. Linné, *Blowguns in Ancient Mexico* (Ethnos, vol. 4, pp. 56-61, Stockholm, 1939), pp. 56-57.

21 Edward King (Lord Kingsborough), *Antiquities of Mexico* (9 vols.: vol. 1, London, 1831-1848), p. 38.

27–42 Valley of Mexico (1200 AD, traditional accounts: 1520-1698, eye-witness accounts)[22]

43–44 Colima-Michuacan (Tarascan) area (1559-1587)[23]

THE SOUTH AND CENTRAL AMERICAN BLOWGUN IN MODERN TIMES

At the present time there are three major types of South American blowgun. In the Guianas and in the Negro River basin (the northeastern part of the continent), the prevalent blowgun type is the two-tube weapon. In the west—the upper Amazon and Montaña—a split-half composite gun is used. On the edges of the blowgun area and interspersed throughout the region is a simple, one-tube blowgun. Between the composite and two-tube areas are intermediate blowgun forms in which the outer sheath of a two-tube gun is split and bound. All South American types are employed with a dart as projectile (two exceptions will be noted below). The Central American blowgun, as in Conquest times, is a simple tube implement and uses a pellet rather than a dart.

In the listings below entry numbers refer to numbers on the map of distributions in historic times (Fig. 2). Blowgun types in the list are identified by symbol: these include s—simple blowgun; tt—two tube; c—composite; int—intermediate; unk—type unknown; D—dart-using blowgun; P—pellet-using blowgun.

1 Mojos (s: D)
2 Huari (s: D)
3 Huanyam (s: D)
4 Pawunwa (s: D)
5 Rio Jurua tribes (c: D: also P secondary)
6 Ipuriná (c: D)
7 Jamamadí (c: D)

22 Don Fernando de Ixtlilxochitl, "Relaciones históricas de los Tultecos y de los Chichimecas" (in Kingsborough, *Antiquities of Mexico*, vol. 9, 1831-1848), p. 335; Hernan Cortés, *Cartas de relación de la conquista de Méjico* (2 vols., Madrid, 1942), vol. 1, p. 96; Gonzalo Oviedo y Valdés, *Historia general y natural de las Indias* (4 vols., Madrid, 1853), vol. 3, p. 299; Bernal Díaz del Castillo, *The Discovery and Conquest of Mexico* (A. P. Maudslay, ed. and tr., London, 1933), pp. 340-341; Juan de Torquemada, *Monarquia Indiana* (3 vols., Mexico, 1943), vol. 1, pp. 292, 460; Alonso de Molina, *Vocabulario de la lengua Mexicana* (Leipzig, 1880), pp. 20, 118; Bernardino de Sahagún, *Historia general de las cosas de Nueva España* (5 vols., Mexico, 1938), vol. 3, p. 165; Gemelli Careri, "A Voyage Around The World" (in *Churchill's Voyages*, 6 vols.: vol. 4, pp. 5-568, London, 1745), p. 512.

23 A map that formed part of the correspondence concerning the Cavendish raid on the south Mexican coast, Autumn 1587, pictures (as a decorative motif) a blowgunner in the general Tarascan area (map, courtesy of Dr France V. Scholes, University of New Mexico). Maturino Gilberti, *Diccionario de la lengua Tarasco ó de Michoacán* (Mexico, 1901), p. 226, list the word for blowgun pellet in Tarascan.

FIG. 2. Present-day distribution of the blowgun. Southeast and Eastern Woodlands, simple blowgun: South and Central America, squares, simple type; unmarked, composite type; circles, two-tube type; *, intermediate types; ?, type unknown; underline, pellet projectile.

8 Paumari (c: D)
9 Mangeroma or Tucun-dyapa (c: D)
10 Cholones (c: D)
11 Conebo (c: D)
12 Jívaro (c: D)
13 Napo (c: D)
14 Piojé (c: D)
15 Canelo (c: D)
16 Zaparo (c: D)
17 Witoto (c: D)
18 Guayahuita (c: D)
19 Panobo (c: D)
20 Canelo (c: D)
21 Muinane (c: D)
22 Cocama (c: D)
23 Cocamilla (c: D)
24 Omagua (c: D)
25 Yameo (c: D)
26 Cashano (c: D)
27 Yagua (c: D)
28 Ticuna (c: D)
29 Eastern Ecuadorian groups (c: D)
30 Pasé (c: D)
31 Huambisa (c: D)
32 Jurí (c: D)
33 Mirana (c: D)
34 Peguche village (unk: P)[24]
35 Makú (tt: D)
36 Buhagana (c: D)
37 Yukana (c: D)
38 Maue (c: D)
39 Umaua (c: D)
40 Boro (c: also s secondary: D)
41 Andoke (c: also s secondary: D)
42 Resigero (c: D)
43 Nonuya (c: D)
44 Senhora de Guia Indians (tt: D)
45–47 Uaupés River groups (tt: D)
48 Rio Ariary Indians (tt: also int secondary: D)
49 Tiquié (int: D)
50 Múra (tt: D: this report, from the Manáos area, is unclear)
51 Upper Orinoco groups (tt: D)
52 Piaroa (tt: D)[25]
53 Panare (tt: D)[26]
54 Maionkong (tt: D)
55 Piacoco (tt: D)
56 Wacawoio (tt: D)
57 Macusí (tt: D)
58 Arecuna (tt: D)
59 Wapisiana (tt: D)
60 Barama River Akawaí (s: D)[27]
61 Akawaí, general eastern Guiana groups (tt: D)
62 Maquiritare (tt: D)
63 Trumaí (unk: used as toy, projectile unknown)[28]
64 Indians of Antioquia (unk: D)

24 Elsie C. Parsons, *Peguche: a Study of Andean Indians* (University of Chicago Publications in Anthropology, Ethnological Series, 1945), p. 32.

25 Carroll L. Riley, field notes.

26 *Ibid.*

27 John Gillen, *The Barama River Caribs of British Guiana* (Papers, Peabody Museum of Harvard University, vol. 14, no. 2, 1936), p. 3.

28 Buell Quain, "The Trumai" (as quoted by Claude Lévi-Strauss, "The Tribes of the Upper Xingu River," *Handbook of South American Indians*, J. H. Steward, ed., Bulletin, Bureau of American Ethnology, no. 143, vol. 3, pp. 321-348, 1948), p. 335.

65 Paez (unk: D)
66 Cayapa (c: D)
67 Chocó (c: D)
68 Cuna (s: unk: D: also P: the Cuna seem to have received blowgun influences from both South and Central America)
69 Bribri (s: P)[29]
70 Talamanca Indians (unk: projectile type not reported)[30]
71 Ulwa (unk: projectile type not reported)[31]
72 Sumo (unk: projectile type not reported)[32]
73 Jicaque (s: P)[33]
74 Southern Maya and Kekchi (s: P)[34]
75 Jacalteca Maya (s: P)[35]
76 Chorti (s: P)[36]
77 Zapotec (s: P)[37]

THE BLOWGUN IN THE EASTERN UNITED STATES

The blowgun in this area is reported only for very recent times. An examination of early sources (i.e., 16th and 17th century) included reports of the Narvaez and De Soto expeditions, narratives of early French and English travelers and of the Jesuit Relations of the Canadian and Mississippi regions. These early accounts—many of them surprisingly detailed—failed to record the implement. In addition, we have the excellent compilation of Dr John R. Swanton, whose researches in historical materials did not uncover the blowgun. This negative status is confirmed in a personal communication from Dr Swanton.

In modern times, however, the blowgun has been recorded throughout the Southeast culture area, with an extension northward into the Eastern Woodlands. The gun, in the eastern United States, is a simple tube, usually of reed. The projectile is a dart, always used without poison.

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29 Alanson Skinner, *Notes on the Bribri of Costa Rica* (Indian Notes and Monographs, Museum of the American Indian, vol. 6, pp. 41-113, 1920), pp. 83-85.

30 A. Lane Fox, *Blowpipe etc. from Costa Rica* (Journal, [Royal] Anthropological Institute, vol. 4, pp. 363-364, 1875), pp. 363-364.

31 Eduard Conzemius, *Ethnographical Survey of the Mosquito and Sumu Indians of Honduras and Nicaragua* (Bulletin, Bureau of American Ethnology, no. 106, 1932), p. 73.

32 Walter Lehmann, *Zentral-Amerika* (2 vols., Berlin, 1920), vol. 1, p. 503.

33 V. Wolfgang von Hagen, *The Jicaque Indians of Honduras* (Indian Notes and Monographs, Museum of the American Indian, no. 53, 1943), pp. 50-52, 91.

34 J. Eric Thompson, *Ethnology of the Mayas of Southern and Central British Honduras* (Field Museum of Natural History, Anthropology Series, vol. 17, pp. 27-213, 1930), pp. 87, 120.

35 Oliver LaFarge and Douglas Byers, *The Year Bearer's People* (Middle American Research Series, no. 3, New Orleans, 1931), p. 64.

36 Charles Wisdom, *The Chorti Indians of Guatemala* (Chicago, 1940), p. 70.

37 *Vocabulario Castellano-Zapoteco* (Publicado por la Junta Colombina de México, 1893), pp. 222, 13.

Numbers listed below refer to the North American section of our Post-Conquest map (Fig. 2). Dates are given for the 18th and early 19th century reports of the blowgun. All other references are from recent times.

1 Cherokee (1756-1765)
2–3 Choctaw (1768, 1775)
4 Seminole (*c.* 1800)
5–7 Cherokee
8–9 Choctaw
10 Yuchi
11–13 Creek
14–15 Catawba
16–17 Shawnee[38]
18 Koasati
19–20 Chitimacha
21 Tunica[39]
22 Houma (this blowgun was composite, being made of two grooved lengths of cypress wood. Origin of this gun is unclear)
23 Atakapa
24 Iroquois (1795-1797, among the Seneca)[40]
25–26 Iroquois[41]
27–28 Lenape and Munsee Delaware[42]
29 Penobscot (toy: may be of White influence)[43]

38 Oliver M. Spencer, *Indian Captivity* (New York, 1852), p. 73; Dr Erminie W. Voegelin, personal correspondence.

39 Dr Mary R. Haas, personal correspondence.

40 Issac Weld, *Travels through the States of North America and the Provinces of Upper and Lower Canada during the Years 1795, 1796, and 1797* (4th edition, 2 vols., London, 1807), vol. 2, pp. 143-144. Dr William N. Fenton (personal communication) states that his researches failed to find earlier references to the blowgun among the Iroquois.

41 Lewis H. Morgan, *League of the Ho-De'-No-Sau-Nee or Iroquois* (Rochester, 1854), p. 379; Frank G. Speck, *The Iroquois, a Study in Cultural Evolution* (Bulletin, Cranbrook Institute of Science, no. 23, Bloomfield Hills, Mich., 1945), p. 35.

42 Mark R. Harrington, *A Preliminary Sketch of Lenape Culture* (American Anthropologist, n.s., vol. 15, pp. 208-235, 1913), p. 221; Vernon Kinietz, *Delaware Culture Chronology* (Indiana Historical Society, Prehistory Research Series, vol. 3, pp. 1-143, Indianapolis, 1946), pp. 63-64. Kinietz believes that the Lenape received the blowgun after their arrival in Oklahoma. On the map (Figure 2) both Delaware groups are listed in their present-day positions, as their ancestors in the Trenton-Philadelphia region presumably did not have the weapon.

43 Frank G. Speck, *Penobscot Man* (Philadelphia, 1940), p. 182.

A PROJECTED HISTORY OF BLOWGUN DEVELOPMENT IN SOUTH AND CENTRAL AMERICA

The blowgun at Conquest times was widely used in South and Central America. At that period there were two clearly defined areas of use. In western and northern South America a dart-using blowgun was employed with poison, while in the Mexico-Maya area a gun using pellets of clay was recorded. In modern times the South American blowgun extends throughout the Montaña, western Colombia, the upper and middle Amazon, and the Orinoco and Essequibo drainages. The pellet blowgun disappeared from the Valley of Mexico during historic times but its modern distribution includes all of southern Central America.

In no part of its area of distribution in Central and South America does the blowgun completely replace other projectile weapons. In Central America its use was probably always secondary, with the bow (southern Central America) and the dart and spear-thrower (Valley of Mexico) more important in hunting and in warfare. In eastern South America at the present time the blowgun and the bow tend to complement each other; that is, the bow is used to kill large game, while the blowgun is employed for birds and small animals. Only in parts of western South America, where thick jungle restricted the use of the bow and large animals were not prevalent, is the blowgun the only important hunting weapon. In this area, particularly in the northern Montaña, the lance and javelin are the important war arms.

In general, it may be said that the blowgun serves a specialized purpose that no other implement (excepting the modern shotgun) can match. This is the shooting of small animals or birds high overhead, with pin-point accuracy. To this extent the importance of the blowgun depends, not so much on availability of other weapons, as on the nature of the tropical forest.

With the foregoing summary in mind we can turn to the problem of origin and original distribution of the blowgun. A discussion of pre-Columbian, trans-Pacific diffusion of the implement would not be profitable here. Proponents of such a scheme tend to ignore the factors of time, space, and means of transport. The suggestion that the blowgun diffused from the Eastern Hemisphere after Columbus' time is also quite improbable in the face of known pre-Conquest occurrences.

In an examination of the origin of South and Central American types of blowgun, it is necessary to look at the distribution pattern as of Conquest times. Two things are immediately obvious. There were, at that date, two general types of blowgun (dart-using and pellet-using) and these types were separated by a

large gap in southern Central America. This type difference and the fact of geographical isolation might suggest separate invention for the guns in South and Central America. There are, however, other traits (metal working, costume types, certain art forms, etc.) that show inter-continental culture transmission at an early date. The blowgun has considerable antiquity: it is a virtual certainty that the implement was used, both in the Valley of Mexico and in Peru, a thousand years before Conquest times. Under the circumstances, it seems probable that the blowgun, like numerous other traits, diffused from one continent to the other under circumstances, and at a time, not now known.

The South American blowgun most like the historic Maya-Mexican type is the simple gun. This single tube of cane or bamboo is found (at least as used to the exclusion of all other types) only on the outskirts of the present blowgun area. The peripheral distribution plus the simplicity of the one-tube blowgun suggest it as the prototype. It it were indeed the prototype, presumably this variety of gun had, at one time, a distribution continuous with the Maya-Mexican type. It may be that pellets anteceded darts in both South and Central America. The appearance of pellets in modern South America might suggest a "vestigal" trait; this, at any rate, is the view of Yde. We must remember, in this connection, that the earliest finds of blowguns in the two continents show a differentiation of projectiles. It is thus equally possible that a secondary elaboration—a change from darts to pellets—took place after the blowgun reached Mexico. Development of the blowgun pellet came, perhaps, from a period of general ceramic experimentation, but we have no data for this.

The place of origin of this first blowgun is equally obscure. Presuming an original continuous distribution, the geographical center of the blowgun would be somewhere in extreme northern South America. This is not to say that the blowgun was invented there. More likely, from point of view of environmental conditions, and considering present-day elaboration, the upper Amazon was the original home of the implement.

In the South American area the simple blowgun gave way to two more complex types. While historically documented reconstruction is impossible, we will here suggest certain factors that probably were operative in the development of these types.

Before entering this discussion it would be well to review the reconstruction of Yde—the only recent attempt to interpret the type differentiation and distribution of the South American blowgun. Yde suggests an original development of the two-tube blowgun—a tube of *Arundinaria* reed with a protective sheath of *Paxiuba* (*Socratea exorrhiza*)—in the Guianas. The gun then spread westward

to the Uaupés-Negro valley. The *Arundinaria* was imported from the Orinoco but the *Paxiuba* was not so imported, and the Uaupés groups were forced to find new material for the outer tube. This new stem necessitated splitting to allow insertion of the *Arundinaria* tube. The natives then realized that the split tube, without the inner section, made an adequate blowgun. In this new form the blowgun spread from the Japura-Uaupés to the upper Amazon and the Montaña.[44]

This schematic approach has several errors. Yde has assumed a logical sequence of forms from simple to complex without taking into account as determinants the nature of the materials utilized. The prevalent type of blowgun material in the Uaupés was not *Arundinaria schomburgkii* but was, rather, the *Iriartea* palm. There was, also, no lack of the *Paxiuba* in the upper Negro valley, this plant being very widespread in South America.[45] More important, however, is the fact that Yde's presumed intermediate "split sheath" form cannot be held to be a prototype of the composite blowgun. The composite type was by no means formed from a halved-stalk but is the result of a specialized kind of wood carving. In addition, the blowgun was widespread in the west at Conquest times and the greatest emphasis on the modern blowgun is in that area. The evidence at hand suggests, if anything, that the northeast is a periphery in terms of blowgun distribution.

As is implicit in Yde's paper, the *Arundinaria* reed must have been adopted by various Guiana groups very early in their acquaintance with the blowgun. The reed grows ten or more feet between nodes; it is easy to clean of pith and the bore, when cleaned, is extremely smooth and regular. The *Arundinaria* must have been commercially important for blowgun use from early times; it is still widely traded today.

The change from a single tube to the two-tube blowgun was, actually, a rather simple one and arose from the necessity of protecting the brittle reed *Arundinaria* from cracking. There are two ways to do this: by wrapping or by enclosing in a sheath. That the latter was adopted here was perhaps due to the availability of large, relatively straight, stems (*Socratea exorrhiza* and *Bactris cubaro* in particular). There are two sub-areas of the two-tube blowgun distribution. In the Negro River basin, the *Arundinaria* is replaced by the *Iriartea* palm, a move necessitated by the difficulty of obtaining *Arundinaria schomburgkii* in that region.

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44 Yde, *Regional Distribution*.

45 B. E. Dahlgren, *Index of American Palms* (with) A. C. Noé, *Fossil Palms* (Field Museum of Natural History, Botanical Series, vol. 14, pub. 355, 1936), p. 262.

A parallel evolution of the blowgun must have been taking place in the western Amazon area. This is a region especially fitted for the blowgun: extensive jungle forests and a still atmosphere (necessary if the light dart is to be accurate in flight). There are also relatively few small tree mammals. The limitations of the simple blowgun are severe, especially as this area has no good blowgun material ready at hand. The available stems, *Paxiuba* for example, tend to irregularity. The nodes are close together and these joints form ring-like ridges on the interior of the stems at the septa. In order to smooth out these interiors an extremely large bore is necessitated, too large for optimum use with a blowgun dart. Nevertheless, the jump from the simple to the composite blowgun is a large one. It is this situation that tempts writers to accept the *deux ex machina* of overseas diffusion, or to attempt, like Yde, to rank present-day types in an evolutionary sequence.

The exact development of the composite gun cannot now be reconstructed but we can suggest certain things that might have influenced this development. As has been said, the upper Amazon area presents optimum conditions for blowgun use. The simple blowgun, of some local reed or palm, could not have fully utilized the possibilities of the weapon. The region, particularly the northern Montaña, was one of considerable technical skill in the crafts, in part a reflection of Andean contacts. The chonta palm (*Guilielma ciliata* or *insignis* ordinarily—though there is some confusion in the literature, and two genera may be involved here) was undoubtedly utilized in a number of ways. It is used today, for example, in house construction, fence-making, weapons, etc. The properties of chonta—its hardness, durability, and especially its straight grain—would have been well known. This knowledge could have been applied to the splitting, grooving, and shaping of the blowgun tube. No new techniques are involved; once carved the chonta tube is bored and polished in much the same way as are the stems used in the simple tube blowgun.

The chonta blowgun, with its precision-smooth bore and straightness of tube, is vastly superior to the simple gun. Once invented, the chonta type may have spread rapidly along the Amazon tributaries. This diffusion met the westward expansion of the two-tube gun, from which arose, as might be expected, several intermediate types. The composite gun did not replace the two-tube gun in the Guianas and Uaupés areas: this is beyond the environmental limits of the chonta palm, and in the Guianas, the *Arundinaria* blowgun is almost as effective and far easier to make.

The time of diffusion of the blowgun cannot be definitely ascertained. The consensus of opinion among anthropologists who have worked on the blowgun

problem is that wide diffusion, at least of the more complex types, is post-Columbian. This position was first stated by Nordenskiöld and it depends on two assumptions that have taken on the aspects of truisms. These are (1) that the blowgun is next to worthless without effective dart poison (the spread being, thus, conditioned by availability or lack of poison), and (2) the most common dart poison, curare, came into general use only after Conquest times.

In regard to the first point, it is true that a dart poison adds to the effectiveness of the blowgun. But it is by no means essential: without poison the blowgun can be used efficiently for small game. To give one example, the Panare of the western Guianas normally kill birds with non-poisoned darts, reserving curare poison (of which they have an ample supply) for monkeys. The two-tube blowgun used by the Panare is powerful enough to transfix the smaller birds at ranges of one hundred feet or more. In laboratory experiments at the University of New Mexico, a muzzle velocity of 111 feet per second and impact power of .57 foot pounds were achieved with the use of a Panare blowgun.[46] Unfortunately, the experimenters were relatively inexperienced in blowgun shooting, for there are several factors (amount and dampness of the piston cotton, and amount and pressure of air introduced into the tube) which necessitate a great deal of experimentation to insure maximum efficiency. There is no doubt that the Panare achieve greater speeds. In the field a dart, blown by a Panare, was clocked at 150-plus feet per second. In regard to this problem of speed and impact, we must remember that blowguns with non-poisoned projectiles were used to a considerable extent both in Central America and in the southeastern United States. In Central America a clay pellet is reported to have sufficient shock power to kill or stun even large birds. All in all, the use of poison no doubt increases the value of the blowgun, but sweeping statements as to the "worthlessness" of the non-poisoned dart must be taken with reserve.

The belief that curare was late in appearing on the scene is based on the fact that there is little mention of this poison in the early sources. Actually, the general problem of dart poison is still unsettled. The Chocó Indians of Colombia and the Cayapa tribe of Ecuador today use a poison definitely identified by Santesson as Pacurine, a glucoside with cardiac effects.[47] The tribes of the greater part of the blowgun area—the upper Amazon, Negro-Uaupés, Orinoco, and Essequibo regions—are generally considered to use curare, a derivative of *Strychnos*.

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46 Dr Richard Runge, Department of Physics, University of New Mexico, assisted in these experiments.

47 C. G. Santesson and Henry Wassén, *Some Observations on South American Arrow Poisons and Narcotics* (Ethnological Studies, vol. 3, pp. 330-358, Göteborg, 1936), p. 355.

In terms of specific distribution, poisons are reported at the Conquest period from Bolivia, the Peruvian Montaña, upper Amazon, Colombia, and from around Lake Maracaibo. It is, of course, uncertain what type or types these poisons were. The point here is that, at Conquest times, dart poison was as widely distributed, according to the records, as the blowgun itself. Poisons referred to as "curare" (or by some variant name, as uruaí, etc.) are manufactured today in every area of blowgun use in South America, excepting only the extreme northwest of the continent. Considering this point in conjunction with the distribution of poisons at the time of European contact, it seems likely that the use of dart poison is an old trait. It may be also that the question of dart poison is part of a larger problem. The use of poison for arrows is known from the Antilles, northern South America, the upper Madeira, northern Chaco, and the Araucanian region. The distributions of dart and arrow poisons form a more or less continuous area, and it is possible that the two may represent separate elaborations of a single trait.

THE PROBLEM OF THE EASTERN UNITED STATES

The blowgun in this area is a single tube, ordinarily of *Arundinaria macrosperma*. It is always used as a subsidiary implement and is usually employed by children. The projectile is a dart and poison is not used.

Distribution of this blowgun in modern times extends throughout the Southeast, the weapon being reported for tribes from Carolina to east Texas. It has not been noted for the aboriginal groups of Virginia and the Middle Atlantic states. It appears, however, among the Iroquois, and, in very late times, among the Delaware.

This North American blowgun, which resembles the South American simple type, was regarded for many years as a pre-Columbian diffused element from South America. It is necessary to reëxamine this position, as there are two factors that militate against a theory of pre-Columbian South American origin. These are:

(1) No records of the blowgun in the Southeast and Eastern Woodlands before about 1750 have been found. In the period 1750-1800 the gun was recorded for the Cherokee, Choctaw, Seminole, and (1795) the Iroquois. It has been suggested that the Iroquois received the blowgun from one of the southern Iroquoian-speaking groups, probably after 1750.

(2) The blowgun seems never to have reached the Antilles, the most logical area of contact between the Southeast and South America.

The problems of blowgun diffusion to the Southeast have been most recently discussed by Speck. In regard to contacts with South America, Speck lists a

series of traits—a "complex"—that the Southeastern blowgun shares with the South American implement. These traits include common lack of a blunt bird arrow (actually lacking only in parts of western South America), the similarity of dart form, use of cotton or feathers for a piston-gasket, the limiting of the blowgun to small game hunting, and the use of a similar stance while shooting.[48]

On close examination, this does not seem to be a valid trait complex. All blowgun darts are similar, the dart form being set mainly by the peculiarities of the implement as a blowgun. A gasketing of some light material is basic to any dart-using blowgun and is inherent to the mastery of the principle of blowgun propulsion. The restriction of the blowgun to small game is also no real part of a specific complex of traits. The blowgun without poisoned darts could hardly be used effectively against large mammals or men because of their covering of hair, tough skins, or the inability of a light dart to penetrate to any depth.

An interesting point is the stance of the hunter while shooting, particularly the mode of grasping the tube. This is largely a function of the structural peculiarities of the weapon, the possibilities being actually quite limited. One hand must, in any case, grasp the gun at the mouthpiece. The other can hold the barrel at arm's length. The Catawba use this latter method, which gives lateral stability for firing in a horizontal plane. The preferred form in South America (and in some parts of the Southeast) is to hold the implement with both hands near the mouthpiece, the lower arms jutting at right angles to the barrel. This position seems to be a concomitant of the constant necessity for shooting at game overhead in trees. When both hands grasp the tube of the gun near the mouth end, the arms act as lateral braces. The tip of the blowgun, then, describes a small regular circle, giving a certain gyrostatic effect. The muzzle of the gun briefly covers the target at one point in each revolution. Accuracy, for a skilled hunter, is mainly a matter of timing.[49]

What is involved in this discussion is the fact that this group of traits, which supposedly point to historical contact between South America and the Southeast, would be inevitable adjuncts of any independent invention of the blowgun.

If the Southeastern blowgun was diffused aboriginally from South America, the diffusion must have taken place before knowledge of poisons or of complex types of blowguns became general in South America. It is possible that the

48 Speck, *Catawba Blowgun*, pp. 198-204. Speck, however, considers the problem of blowgun diffusion to this area an open question.

49 In this respect it might be pointed out that the blowgun sights—so called—(usually teeth or bits of bones embedded on the outside of the gun barrel) actually are to mark the weak or thin side of the tube. This allows the user always to hold this side uppermost, thus preventing downward warping of the gun when in use.

Southeastern gun came from the Maya-Mexican area, but, as we noted, a pellet gun was used there from very early times. In either case, the problem of ways, means, and times of transport would remain. The most serious objection to early diffusion remains, however, the lack of mention of the blowgun in those first detailed European accounts for the Southeast. It seems scarcely possible that the implement would have been overlooked by the many observant early travelers.

Discounting pre-Columbian diffusion, we are left with the alternate possibilities of independent invention or introduction after the Conquest. The latter source is certainly possible: either direct contact with the weapon or idea diffusion of some sort would serve. The Spanish, in particular had opportunity to introduce blowgun users, or the blowgun idea, into the Southeast.

If the blowgun was developed independently, it may have been devised originally as a toy. The Southeastern environment is not particularly well suited to the blowgun and it never won an important place as a hunting weapon in that area.

One other factor should be mentioned here. The possession of the blowgun by the Iroquois has been used to demonstrate their Southeastern origins. If the blowgun diffused northward to the Iroquois in recent times (and this seems to be the case), it must be subtracted from that list of traits that suggest the Iroquois link, generically, to the Southeast.

GENERAL CONSIDERATIONS

The study of the blowgun, as such, is of only particularist interest. There are, however, points of general anthropological concern which may be profitably discussed.

One important problem is the question of the origin of the New World blowgun and its meaning in terms of the general concept of invention. An invention can best be defined as the purposeful creation of an item of culture, material or non-material. Basically, inventions can be divided into two major types. The first is that of an invention that represents a series of minute steps from some previously known tool; in other words, an evolutionary development of a culture trait. The second type of invention is revolutionary and represents a new trait or trait-complex, developed without immediate antecedents. The change in the latter case is qualitative rather than quantitative: though all the material elements necessary for the invention preëxist, they must be combined in some new way.

An excellent example of the first type of invention is the development of the boomerang, a weapon indigenous to aboriginal Australia. That implement can be

shown to have had a gradual evolution from the throwing-stick, which in turn may have evolved by stages from a hand-held club or stick. In no case is there a clear break of forms and nowhere along the line of development is there any change in the principle of operation.[50]

The American blowgun (like a number of items—the bow, for example) represents the second kind of invention. It has no known antecedents among weapons and so it is necessary to examine the general background for clues as to its origin. The first American blowgun must have come from an area of familiarity with the type of material (the various reeds and palms) that could be used in construction of the gun. The utilization of hollow stems is common today in South American tropical forests and probably was so in the past. Hollowed reeds are used at the present time in the Guianas as devices to aid in drinking from streams, using the "soda-straw" technique. Other hollow reed or palm stem instruments are found in northern South America. These include bamboo water containers, reed pipe and cigar holders, snuff containers, and enema tubes. Very widespread also are reed and bamboo musical instruments: flutes, trumpets, and panpipes. The flute, operating on a principle somewhat analogous to that of a blowgun, is, today, distributed throughout the blowgun area and is found, archaeologically, from very old horizons.

The distinguishing feature of the blowgun is the use of the piston, employing the idea of compressed air. Unlike the Malay region, where the piston was utilized in several ways, the American Indian used it only for the blowgun. This revolutionary feature must, then, have appeared as a separate invention. It is possible that the gun was first employed as a toy; certainly its value as a hunting implement would not have been immediately recognized, but consciousness of such use constituted it as an invention in our sense. At any rate it was devised by people already familiar with some of the uses of hollow stems and thus acquainted with the first steps in blowgun manufacture.

Another, somewhat tangential, problem is that of blowgun elaboration in various parts of the world. This is important, for the blowgun represents, in the viewpoint of general anthropology, an excellent example of parallelism of culture development. Taking a world view, the blowgun seems to have been invented two (and possibly three) times. The trait-complexes that surround the implement in both America and Southeast Asia are remarkably similar. We have shown, however, the inevitable development of most of this complex from any independent invention of the blowgun. Only the more peripheral features of the blowgun

50 D. S. Davidson, *Australian Throwing-Sticks, Throwing-Clubs, and Boomerangs* (American Anthropologist, n.s., vol. 38, pp. 76-100, 1936).

complex—dart poison and quivers, for example—are not invariably found with the gun but even these tend toward sequential development. If poison *is* adopted for blowgun darts, a quiver (or some other cradling device) becomes necessary to carry them safely.

What is involved here is not so much a principle of limited possibilities as a channeling of secondary traits according to the peculiar demands of the complex. In respect to this general point, it might be suggested that other traits having separate distributions in the New World and Old, which have been used to suggest inter-hemispherical connections, should be examined in this light.[51]

The implications of the study of the blowgun are not concerned solely with the theoretical problems of invention and parallel development. In another sense, the blowgun distribution may be considered part of a wider problem of American historical ethnology—that is, the general question of culture connections in the New World. In South America the blowgun study is part of a general problem of movements of peoples and ideas in the tropical forest region and between the tropical forest cultures and those of the Andes. On a still larger scale, the blowgun is one of those traits that may show inter-continental culture affiliations at an early time. The blowgun then is a "diagnostic" trait, and a blowgun study, synthesized with other studies, can help to further clarify the culture history of America.

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51 For a paper somewhat on these lines see, Charles John Erasmus, *Patolli, Pachisi, and the Limitation of Possibilities* (Southwestern Journal of Anthropology, vol. 6, pp. 369-387, 1950).

THE BEARING OF CERAMICS ON DEVELOPMENTS IN THE HOHOKAM CLASSIC PERIOD

ALBERT H. SCHROEDER

THE PREHISTORIC CULTURE of the Hohokam of southern Arizona, defined and named by Gila Pueblo, is quite distinct and easily distinguished from the more widely known Pueblo culture of northern Arizona. Between 900 and 1150 AD, during the Sacaton phase, the material culture of the Hohokam reached its greatest ornateness and exhibited many elements of possible Mexican affiliations.

The major local traits, which most clearly separate the Hohokam as a development unrelated to the Pueblo during this period of time, consist of jacal houses, loosely grouped in rancheria style villages; cremation of the dead; paddle-and-anvil pottery fired in an oxidizing atmosphere and decorated in red; ball courts; irrigation agriculture; highly developed work in shell; and ornately carved stone vessels.

During the Classic period which followed, many new elements appeared, and it is with the two phases of this period, Soho (1150-1300 AD) and Civano (1300-1400 AD), that this paper is concerned.

In 1928, Schmidt reported on stratigraphic tests he conducted in Hohokam trashmounds in the Salt River valley of southern Arizona. His tests revealed, in this valley where red-on-buff pottery and cremation had been the norm, that a polychrome pottery and extended burials appeared in the last phases of occupation. To account for their appearance he suggested the new traits may have resulted from an influx of another unrelated group of people.[1]

In 1929, Gladwin developed Schmidt's idea further and suggested that the people of the Salado Branch, situated near Roosevelt Lake on the Salt River, were the bearers of these and other new cultural traits which he defined. He placed the time of their entry between 1300 and 1350 AD.[2]

In 1940, on the basis of the results of a stratigraphic survey in the Salt River valley, it was pointed out that the appearance of so-called Salado traits in the last phases of occupation, such as extended burials, redware, and caliche-walled structures, actually occurred as early as 1150 AD. These as well as other new

1 Schmidt, 1928, p. 281.

2 W. and H. S. Gladwin, 1929, pp. 37, 70-71. See also W. and H. S. Gladwin, 1933, p. 6; 1935, p. 254, and Haury, 1945, p. 208.

traits became so dominant by 1300 AD that it almost appeared that the Hohokam had left the area. However, it was concluded that a number of the Hohokam remained in the valley, as there was no sharp difference between the last two phases of occupation. Only a gradual decline or submergence of Hohokam traits was evident.[3] In 1947, the possibility of a Sinagua influx from the Verde Valley was proposed to account for the appearance of the new traits around 1150 AD.[4]

In this paper, the ceramic development of the Classic period is considered as one of several proposed approaches to demonstrate that the pattern is one of a Sinagua-Hohokam blend rather than the result of a Salado influx.[5] Architecture, burial, and other traits will be considered in future papers.

The pottery of the Salt River valley, considered in Table 1, represents a development practically untouched by outside influences up through the Sacaton phase, about 1150 AD. In the following Soho phase a redware, often with a smudged interior, made its appearance along with several other traits. Also late in this phase, around 1300 AD, Gila Polychrome appeared for the first time.

TABLE 1

Phase	*Date*	*Plain*	*Red-on-buff*	*Red*	*Polychrome*
	1400				
Civano		71.3	2.7	25.0	.4
	1300				
Soho		68.8	11.0	16.2	2.0
	1150				
Sacaton		69.5	30.2	.3	0
	900				
Santa Cruz		75.2	24.8	0	0
Gila Butte		86.0	14.0	0	0
Snaketown		84.5	15.5	0	0

Table 1 contains the percentages of the pottery wares encountered in trash-mounds in which stratigraphic tests were made, and quite obviously shows that plainware percentages decreased while those of red-on-buff ware increased up through the Sacaton phase. It is also noted that after the introduction of redware, the percentage of red-on-buff ware fell off abruptly, and plainware made a slight increase. Polychrome was restricted to the last two phases.

3 Schroeder, 1940.

4 Schroeder, 1947.

5 Unless otherwise footnoted, all Salt River valley data are derived from the manuscript report of the 1938-39 survey in the Salt River valley (Schroeder, 1940).

Schmidt's tests in trashmounds at Pueblo Grande and La Ciudad indicated, as does Table 1, an increase in red-on-buff ware from the bottom of the trashmounds to an upper level where black polished interior ware (redware) appeared and occurred in greater quantities than decorated ware. Red-on-buff decreased from this point on up to the top of the mounds, and polychrome was restricted mainly to the three highest strata, in which plainware increased slightly.[6]

The chief contribution of the Salt River valley survey was the breakdown of the red pottery types of the Soho and Civano phases. Consistent differences were noted between the two grades of Gila Red, and for laboratory purposes the poor grade type was called Gila Red and the superior type Salt Red. The separation was made on the following basis:

TABLE 2

Traits	*Gila Red*	*Salt Red*
Mica content	heavy to little	little to none
Polishing striations	very apparent and often in patterns	scarcely apparent but highly polished
Core	red to tan	carbon streak except when smudged
Red pigment	poor to good	usually good
Fire clouds	large and irregular	small
Fracture	crumbling	shattering

TABLE 3

Type	*Trench 1*	*Trench 2*	*Trench 3*
Gila Red	72.0	65.0	63.0
Salt Red	28.0	35.0	37.0
Casa Grande Red-on-buff	9.8	7.1	7.6
Polychrome	3.6	3.7	5.4

With these types established in the laboratory, reference was made to the sites recorded on the survey in order to locate a trashmound with redware to test the validity of this separation. The results of the test in a trashmound at Site 38 are presented in Table 3, plainware being omitted.[7]

6 Schmidt, 1928, pp. 261, 263, 257.

7 In this and the following tables percentages are shown as follows: red types – percent of each type to total redware; other types – percent of each type to total pottery. Red types were so handled to show the variations of one red type as opposed to the other.

This test seemed to indicate that the separation was valid. The analysis revealed that occasionally some red sherds were borderline cases fitting in between the two types: their placement was difficult. It was assumed that Salt Red

Phase	Pottery type	Salt River Valley Survey			Gladwin's Operations						Casa Grande Floors			Layers 1-5 (Schmidt)	Los Muertos
		Site 38	Site 90	Site 6	4	12	1	2	6	3	Bottom	Middle	Top		
Soho	Tusayan Corr.				x										
	Roosevelt B/W	x													
	Tusayan B/R	x													
	Pinedale B/R	x					?	?		?					
	St. Johns Poly.	x													
	Pinedale B/W	x													
	Pinedale Poly.	x													
	McDonald Corr.						x								
Either phase	Salado Red	x												x	
	Pinto Poly.	x		x											
	Gila Poly.	x	x	x			x	x	x	x			x	x	x
Civano	San Carlos R/Br	x												x	
	Tanque Verde R/Br	x	x	x				x	x	x	x	x			x
	Jeddito B/Y							x		x				x	x
	Fourmile Poly.	x		x										x	x
	Tonto Poly.	x	x	x											x
	Glaze														x

FIG. 1. Occurrence of pottery types in the Civano and Soho phases at various sites. (For temporal sequence, read down.)

developed out of Gila Red. The figures also exhibit a trend wherein red-on-buff decreases while polychrome and Salt Red increase. The mound was roughly dated pre-1200 to post-1300 AD. on the basis of associations listed in Figure 1.

Two trashmounds at Site 90, tested for further information, yielded the following results:

TABLE 4

Type	*Mound 5*	*Mound 6*
Gila Red	18.0	13.0
Salt Red	82.0	87.0
Casa Grande Red-on-buff	1.0	1.8
Polychrome	0	.1

It is immediately evident that the situation here was reversed. Salt Red was dominant throughout. In addition, red-on-buff and polychrome were practically negligible. The scarcity of intrusives lessened the possibility of dating as conclusively as in the case of Site 38. However, post-1300 to 1400 AD was considered a good date since the one definite intrusive sherd was of a type (Tanque Verde Red-on-brown) which dates between 1200 and 1400 AD, and was in the upper layer of the mound associated with Gila Polychrome and Salt Red (see Figure 1).

Site 6 was selected as a further check with results as listed in Table 5.

TABLE 5

Type	*Mound 17*	*Mound 18*
Gila Red	6.0	2.5
Salt Red	94.0	97.5
Casa Grande Red-on-buff	.4	.5
Polychrome	.9	.27

The evidence duplicates that of Site 90, and intrusives listed in Figure 1 further substantiate the post-1300 to 1400 AD dates.

The above tests revealed that at Site 38 Gila Red often occurred alone in the lower levels and that it was associated with Salt Red in intermediate and upper levels. At Sites 6 and 90 it occurred in the lower and intermediate levels and was capped by Salt Red, which often occurred alone in some of the uppermost stratigraphic blocks. Moreover, these tests also revealed that as Salt Red increased in proportion to Gila Red, red-on-buff and polychrome pottery decreased.

Reference is now made to Gladwin's work at Casa Grande and Adamsville in the Gila Basin. He had noted two types of red which he referred to as dull red (Gila Red) and burnished red (Salt Red). His breakdown was based on surface appearance only.[8] A digest of Gladwin's finds carried to two figures is listed in Table 6. His non-stratigraphic tests are arranged from early to late

8 Gladwin, 1928, pp. 12, 20.

(left to right) in accordance with his analysis[9] and the percentages of plainware and intrusives have been omitted. Redware percentages have been converted as in the previous tables. His Test 4 is an average of five tests at one site.

TABLE 6

Type	(Test) *4*	*12*	*1*	*2*	*6*	*3*
Gila Red	100	62	44	50	38	26
Salt Red	0	38	56	50	62	74
Red-on-buff	29	12	12	5	6	3.5
Polychrome	0	0	.06	.33	1.2	1.9

His data are similar to that of the Salt River valley survey. As Gila Red decreased, Salt Red increased and red-on-buff decreased. Polychrome appeared in small quantities after Salt Red appeared.

Hastings' excavations at Casa Grande supply additional data regarding the ceramic development. His Operation I (Sacaton phase) revealed red-on-buff and no red or polychrome types, while his Operation II (Soho phase) contained Gila Red (Salt Red not yet having been established as a type), red-on-buff, and Pueblo III intrusives (1100-1300 AD) with a few surface finds of Gila Polychrome.[10]

Similar evidence recently was brought to light in the process of National Park Service stabilization work at Casa Grande. It became necessary to partially excavate a portion of a room which contained three floor levels. The tabulation of the sherds recovered is listed in Table 7, plainware being omitted.[11]

TABLE 7

Type	*Floor*		
	Bottom	*Middle*	*Top*
Gila Red	100.0	96	95
Salt Red	0	4	5
Casa Grande Red-on-buff	2.9	0	1.5
Sacaton Red-on-buff	.4	.5	0
Polychrome	0	0	1.5

Actual percentage figures cannot be compared with trashmound tests since this work was in a partially excavated room, an area about eight feet square.

9 *Idem*, pp. 11-19.
10 Hastings, 1934, pp. A-C.
11 Raymond Rixey, correspondence, 1949.

However, even though one cannot rely too heavily on this type of evidence, the lack of polychrome on the bottom and middle floors, the first appearance of Salt Red on the middle floor prior to the appearance of polychrome, and the presence of polychrome on the top floor all compare well with the above discussed tests.

Basically all tests agree. Ceramically, there is no significant difference between the Salt and Gila River archaeological areas.

Referring back to the work of the 1938-39 survey, an analysis was made to determine the relationships of the two red pottery types with associated cultural material. A few changes were indicated, as noted in Table 8, which also lists

TABLE 8

Traits	*Sacaton Phase*	*Soho Phase*	*Civano Phase*
Redware	Sacaton Red (rare)	Gila Red	Salt Red
Shell	Very ornate	Common	Decrease
Palettes	Very ornate	Plain	Absent
Whetstones	Present	Present	Absent
Drills	Present	Present	Absent
Hoes or parting tools	Present	Present	Absent (?)
Polishing stones	Absent	Present	Present
Reamers	Present	Present	Present
Axes	Present	Absent (?)	Present
Choppers	Present	Absent (?)	Present
Scrapers	?	Absent (?)	Present
(Other traits not encountered in trashmounds)			
House mound	Absent	Present	Absent
Compound wall	Absent	Absent	Present
Cremation	Present	Present	Present
Inhumation	Absent	Present	Present
Jacal wall	Present	Present	Present
Post-reinforced wall	Absent	Present	Absent
Caliche wall	Absent	Rare	Present
Single dwelling	Present	Present	Rare
Contiguous rooms	Absent	Present	Present
Roof supports	Present only in jacal structures		

the traits of the Sacaton phase for comparative purposes. Certain general trends are indicated. From Gila Red to Salt Red periods of dominance, there was a decrease in "luxury" items and associated tools such as drills and whetstones along with palettes and shell work. In Salt Red times there was an introduction of, or increase in, utilitarian tools, such as might be employed in a hunting economy, and an introduction of new architectural traits.[12]

It had been customary in the past, as Haury brought out, to regard the appearance in quantity of so-called Salado pottery types in southern Arizona as the logical point in time to recognize the end of the Soho phase and beginning of the Civano phase.[13] However, this does not seem to be a valid conception in view of present evidence. In the first place, only one so-called Salado type (Gila Polychrome) occurs in any quantity in southern Arizona, and in any case, secondly, the sudden appearance of a foreign pottery type should not be the basis for a phase division.

The appearance of a new intrusive pottery type may indicate a change in the foreign culture concerned, but it does not necessarily follow that a change occurred in the culture of the recipients of the trade ware. Phase distinctions should be based on a group of changes occurring within a local culture. The appearance of a *group* of fairly common foreign elements most certainly could be used as a basis for recognizing a phase change, since such a pattern of traits would indicate either local acceptance of a whole complex of new ideas or an actual influx of people.

The traits listed in Table 8 exhibit trends from 1150 to 1400 AD. No major differences between the traits associated with Gila Red or Salt Red are evident other than an architectural feature—the compound wall which enclosed the house mound area. There is no drastic change between the Soho and Civano phases in the Salt River area, only a shift in dominance or stress—"luxury" items versus "utility" items. Since the majority of traits Gladwin ascribed to the so-called Salado—a group which he postulated entered the Gila Basin around 1300 AD—are now known to have appeared around 1150 AD, these traits can no longer be considered as post-1300 AD diagnostics. Two items only—Gila Polychrome and compound walls—remain in the vicinity of the 1300 AD bracket. The greatest change in local culture occurred around 1150 AD when several new traits were introduced.

Figure 1 lists the intrusives found at the redware sites of the survey as well as foreign types recovered from excavations reported by Gladwin, Haury, Rixey,

12 Hayden, 1941, pp. 216, 226-227.

13 Haury, 1945, p. 50, footnote 99. See also W. and H. S. Gladwin, 1933, p. 6.

TABLE 9

Trait	*Soho*	*Civano*
Gila Red	dominant	decrease
Salt Red	appears after Gila Red and before polychrome	dominant
Red-on-buff	decreases from Sacaton phase	negligible occurrence
Plainware	about same as Sacaton phase	slight increase polishing streaks
Polychrome	appears after Salt Red late in phase	present in small quantities
Tanque Verde Red-on-brown	occasionally present in Salt and more abundant in Gila	usually present in the Salt and Gila
Roosevelt Black-on-white	present	absent
Salado Red	present	absent (?)
Pinedale Black-on-white	present	absent
St. Johns Polychrome	present	absent
Pinedale Black-on-red	present	absent
McDonald Corrugated	present	absent
San Carlos Red-on-brown	?	present
Gila White-on-red	?	present
Jeddito Black-on-yellow	absent	present
Fourmile Polychrome	absent	present
Zuñi glazes	absent	present
Ramos Polychrome	absent	present

and Schmidt.[14] On the basis of correlations of associated intrusives in the Salt River valley, the last three phases are assigned the following dates:

Sacaton phase	900-1150 AD
Soho phase	1150-1300 AD
Civano phase	1300-1400 AD

A listing of the pottery of the two phases of the Classic period of both the Gila and Salt River areas is presented in Table 9. The foregoing discussions indicate

14 Gladwin, 1928, pp. 12-14, 16, 19; Haury, 1945, pp. 106, 174, 180; R. Rixey, correspondence, 1949; Schmidt, 1928, pp. 257, 267, 269, 276, 296-303.

that the ceramic history of the two regions is similar in all respects and it is not felt that a more detailed discussion is necessary in view of other facts presented below.

Gila Polychrome has been recognized as a so-called Salado expression and has been assigned dates of 1300 to 1400 AD.[15] In the Salt River valley tests, this polychrome occurred as a minor ware in the late Soho and Civano phases, pre-1300 to 1400 AD. This pottery has had a dubious status in Hohokam sites. Opinion has varied whether it represents an intrusive ware or a local product manufactured by a foreign group who took up residence with the Hohokam.[16]

The evidence as it stands favors the view that this type was an intrusive product. No foreign utility type appears with it in any quantity. Only rare instances of so-called Salado utility pottery are noted. No other so-called Salado decorated types occur with Gila Polychrome except for an occasional rare sherd. Visual examination of the paste reveals a temper different from local Salt or Gila River products, except for an occasional poor local copy. The decorative treatment is entirely foreign to southern Arizona.

A list of Salado types recovered from the Classic period horizon in the Salt River valley survey reveals one sherd of Salado Red, one of San Carlos Red-on-brown, and one of Gila White-on-red as compared to about 1000 of Gila Polychrome. Gladwin's and Rixey's tests contained Gila Polychrome plus other non-Saladoan intrusives. At Los Muertos one sherd of San Carlos Red-on-brown was recorded as compared to 52 vessels of Gila Polychrome.[17] Schmidt recorded one Salado Red, two San Carlos Red-on-brown, and twelve sherds of Gila Polychrome in his test at Pueblo Grande.[18] Gila Polychrome appears to belong to the status of an intrusive in the Hohokam area.

This situation implies that considerable trading took place, a factor that was by no means uncommon in prehistoric Arizona. The Sinagua were famous for it. Colton first defined this group in the Flagstaff area and, in describing their cultural pattern, stated that they made plain pottery or redware—they did not decorate.[19] The fact stands out that the Sinagua of the Verde Valley imported relatively large quantities of decorated types between 1125 and 1400 AD.[20] Now, since I am postulating that the Sinagua introduced the new traits into the Gila

15 W. and H. S. Gladwin, 1930b, pp. 3, 6; 1935, pp. 219, 254. Later information sets the initial date of Gila Polychrome somewhat earlier, 1250 AD (see footnote 31).

16 Schmidt, 1928, p. 281; W. and H. S. Gladwin, 1929, p. 12; 1935, pp. 251, 254; Schroeder, 1940, p. 124; Haury, 1945, p. 64.

17 Haury, 1945, pp. 50, 63.

18 Schmidt, 1928, pp. 257, 298. These types I have identified on the basis of his descriptions.

19 Colton, 1946, pp. 304, 308.

20 Schroeder, 1947, pp. 235-236.

Valley around 1150 AD, the same practice of importing decorated pottery should be expected.

Types imported into the Salt River valley prior to 1150 AD, as determined by the survey, were relatively few in number. A large traffic of foreign types from the Tonto Basin was not too feasible prior to 1150 AD since the Hohokam of the Tonto area had not yet been heavily influenced by the neighboring Pueblo-like culture to the east.

After 1150 AD, there was an increase in the number of foreign types in the Salt River valley and a shift to the northeast for ceramic trade. This was the result, most probably, of the practice of the newly-arrived Sinagua, accustomed to obtain decorated vessels from the nearest source. Between 1150 and 1300 AD, the Sinagua-Hohokam obtained central Gila and White Mountain pottery, most of which undoubtedly came through the southern portion of the Tonto Basin, an area which also had undergone cultural change in the 1100's. Between 1300 and 1400 AD, intrusives from the northeast continued to enter the Salt River valley, but were supplemented by additional trade pieces (Tanque Verde Red-on-brown) from the nearby Santa Cruz River area to the east. During the same period occasional pieces of Fourmile Polychrome, Zuñi glazes, and Jeddito Black-on-yellow entered the lower Salt River valley, probably via the upper reaches of the Salt. The last-named type may have entered from the west via the Verde Valley, Bloody Basin, and Agua Fria Valley, where it occurs in fair numbers.

The shifts in the trade of intrusive pottery—earlier from the northeast and later from the east—coincide with the introduction into the Salt River valley of many new traits around 1150 AD and the beginning of the dominance of Salt Red after 1300 AD. The increasing crescendo of ceramic trade into the Salt from 1150 to 1400 AD is accompanied by a gradual decrease in the indigenous red-on-buff types to the point where, in the Civano phase, the local type is negligible. In the light of the Sinagua practice of importing decorated pottery and the increasing dominance of their culture over that of the Hohokam during the Classic period, Gila Polychrome need not be considered a product of a Salado influx, especially since other evidence does not support such a migration. The variability of occurrence and association of Gila Polychrome, not only in the Gila Basin but in other areas as well, might also be considered, along with the lack of an associated related utility type, in establishing this pottery type as an intrusive rather than a local article of manufacture.

The evidence of the 1938-39 survey was restricted mainly to trashmound material and the associations contained therein. The trash of all phases in the Salt River valley was found in proper sequence, each succeeding phase overlying

that of the former (with one exception, a case of reversed stratigraphy which does not apply to the problem of this paper). However, there was not a single instance, in sixteen trashmounds tested, where Soho phase material was superimposed *directly* on Sacaton phase trash other than in minute quantities.[21] Soho trash always began on the desert floor, not on the previous Sacaton phase trashmounds, and later Civano phase trash capped the Soho phase material. The reason for this, as Haury has suggested, was evidently a general relocation of villages.[22] This was probably brought about by the Sinagua, who apparently selected new sites away from the Hohokam villages already existing when they entered the valley.

A further substantiation regarding the relocation of sites is revealed by an analysis of Gila Pueblo's survey of 178 sites in the Gila Basin.[23]

86 sites were occupied up to 1150 AD
64 sites were occupied after 1150
15 sites were occupied up to 900 and reoccupied after 1150
13 sites *only* show a continuous occupation through 1150

178 Total

Less than eight percent of the sites survived the readjustment period of 1150 AD.

The Gila Pueblo survey in the Verde Valley exhibits a similar situation.[24]

25 sites were occupied up to 1125 AD
151 sites were occupied after 1125
2 sites were occupied up to 900 and reoccupied after 1125
7 sites *only* show a continuous occupation through 1125

185 Total

Less than four percent of the sites survived the readjustment period of 1125 AD in the Verde Valley, where the same two groups of people met. In all known cases in the Verde Valley, where the Hohokam of pre-1150 had settled on stream terraces, the Sinagua, who entered the Verde Valley around 1125 AD, always selected higher elevations nearby for their home sites.[25] This practice seems to indicate that the two groups lived side by side in the Verde, at least for a short interval. Ap-

21 Schroeder, 1947, pp. 232-233.
22 Haury, 1945, p. 204.
23 W. and H. S. Gladwin, 1929, pp. 53-65.
24 W. and H. S. Gladwin, 1930a, pp. 180-191.
25 See Schroeder, 1951, pp. 61-63 for an example of Hohokam and Sinagua site locations in the Verde Valley.

parently dual occupation was responsible for the relocation of sites in the Gila Basin as well as in the middle Verde Valley.

Gladwin proposed a new phase, the Santan phase (1100-1150 AD), to incorporate various new traits he recognized in the Gila Basin at this period of readjustment. In this he listed the appearance of surface walled structures, the use of a compound, cremation in Casa Grande Red-on-buff jars, no polychrome, post-reinforced caliche walls, and contiguous rooms.[26] Research in the Salt River valley ten years later, when associations were better known, presented a more complete picture. The following new traits were noted at the beginning of the Soho phase: surface-walled dwellings, *house mounds, no compounds,* no polychrome, cremations *and inhumations,* post-reinforced caliche walls, contiguous rooms, and *Gila Red* pottery.

One point of disagreement between Gladwin's list of traits and that of the Salt River valley survey is the presence of a compound (?) (as Sacaton 9:6 in the Gila Basin). Gladwin's analysis of the material from a trashmound at Sacaton 9:6, a site occupied from the Sacaton phase into late Soho times, yielded 62 percent dull red (Gila Red), 38 percent burnished red (Salt Red), 12 percent red-on-buff, and no Gila Polychrome (see Operation 12 in Table 6). This ceramic combination represents a late Soho phase manifestation wherein Salt Red was approaching dominance. These data indicate that the use of a compound developed just prior to the introduction of Gila Polychrome in the Gila Basin, or shortly before 1300 AD, and that the compound was *not* connected with the new traits of 1150 AD if Sacaton 9:6 represents a compound.

In short, Gladwin's Santan phase was defined on the basis of traits that actually existed *throughout* the Soho phase. Since the material finds of the Salt River valley survey indicate that these new traits, which appeared around 1150 AD, developed and continued uninterrupted with small varying changes through the Classic period, it is felt that the designation of a Santan phase should be dropped in both the Salt and Gila areas.

Of primary concern are the events which led up to the appearance of the new traits of 1150 AD in the Salt River valley. Several years ago Gladwin postulated that the Salado people entered the Tonto Basin in the early 1100's, and later introduced the traits with which we are concerned into the Gila Basin. It is now known that these particular traits appeared much earlier elsewhere, and *as a pattern,* which is not the case with the Salado.

Sometime after or around 1070 AD, redware, extended burials, and the use of masonry in lining pithouses appeared for the first time among the Sinagua in

26 W. and H. S. Gladwin, 1929, pp. 26, 33-34, plates 7 and 8.

the San Francisco Mountain area near Flagstaff.[27] Perhaps their appearance in that area may be correlated with the land-rush caused by the eruption about 1066 AD of Sunset Crater east of Flagstaff. At any rate, this region is the northmost extension of these traits *as a pattern.*

By 1120 AD the Sinagua of the Flagstaff region adopted contiguous room architecture for the first time, probably borrowing the idea from nearby Anasazi contacts on the Little Colorado River. Shortly after 1125 redware, extended burials, and contiguous dwellings were carried into the Verde Valley by the Sinagua.[28] About 1150, this same pattern appeared in the Salt River valley along with other Sinagua traits.[29] Thus the traits can be traced from north to south as a *pattern,* though individually each trait appeared earlier in other localities.

A comparison of the ceramic traits of the so-called Salado and the Sinagua of the 1100's reveals certain obvious differences which further favor the introduction of the above discussed pattern by the Sinagua. The Salado were stated to have made black-on-white pottery (the Sinagua did not decorate) and used the coil-scrape technique of manufacturing pottery (as opposed to the coil, paddle-and-anvil method of the Sinagua). Moreover, the Salado did not manufacture a polished redware as did the Sinagua. The Sinagua had a long history behind them in the Flagstaff region. On the other hand, at present the so-called Salado are not recognized as an entity prior to their postulated arrival in the Tonto Basin other than in a very tenuous form.[30] When the two ceramic patterns are compared with the post-1150 ceramic pattern of the Gila Basin, the data favor the Sinagua as the source of changes, not the Salado.

The presence of the Salado in the Tonto Basin proper also is open to question when ceramics are considered. The lack of an indigenous coil-scrape utility ware in the Tonto, the presence of ceramic traits in common with the Gila Basin, and the small percentage of Gila Polychrome, Salado Red, and other so-called Salado decorated pottery types all suggest that the Hohokam in the Tonto Basin underwent a cultural change in post-1100 times, by accepting *Sinagua traits from the Gila Basin.* There is little or no evidence on which to postulate a Salado entry even in the Tonto region.

A few non-ceramic traits might well have entered the Tonto Basin from the east through contacts such as result from normal trade relations. However, there is no group of post-1150 AD traits which occur as a pattern in the Gila, Salt,

27 Colton, 1946, p. 270.
28 *Idem,* pp. 271, 304.
29 Schroeder, 1947, pp. 233-238.
30 W. and H. S. Gladwin, 1935, pp. 212-216; Haury, 1945, pp. 205-207.

and Tonto areas that can be assigned to the so-called Salado or to any group other than the Sinagua. The generalized post-1150 Sinagua pattern, which will be considered in future papers in more detail, consists in part of a combination of paddle-and-anvil pottery, including polished redware; lack of indigenous decorated pottery; extended burial with no pattern of orientation; surface dwellings with rock walls laid up in heavy quantities of mortar; a preference for elevated sites for the main village; and emphasis on utilitarian tools, as opposed to arts and crafts of a luxury nature.

SUMMARY

Several new traits appear in the Gila Basin at the beginning of the Classic period, around 1150 AD, all of which appear to be similar to the pattern of the Sinagua of 1125 AD in the Verde Valley. The ceramic evidence of the time of the introduction of these traits points to a very close relationship with Sinagua pottery and cannot be related to the Salado ceramic pattern. In the late phase of the Classic period a few Salado ceramic types appear in the Gila Basin, but not under circumstances that warrant their being considered indigenous. The lack of any measureable contrast between the two phases of the Classic period, the absence of a new *pattern* associated with the appearance of Gila Polychrome, the continuous development and increase of redware at the expense of red-on-buff ware throughout the entire period, the lack of any coil-scrape utility pottery (Saladoan or otherwise), all indicate that the indigenous pottery of the Classic period was little affected by any Saladoan influence. The ceramic evidence, in fact, tends to suggest that Sinagua elements were more important than Salado influence even in the Tonto Basin.[31]

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31 Since this article was sent to the printer a report by Terah L. Smiley, *Four Late Prehistoric Kivas at Point of Pines, Arizona* (University of Arizona Bulletin, vol. 23, no. 3, 1952) has come off the press. On page 62 he revises the dates of Gila Polychrome to circa 1250-1400 AD. His new dates conform nicely with the evidence in the Salt River valley where this pottery type is often associated with late Soho phase material, which pre-dates 1300 AD.

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NATIONAL PARK SERVICE
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BASKETRY DESIGN AND THE COLUMBIA VALLEY ART STYLE

MARIAN W. SMITH AND HAROLD J. GOWERS

MUCH HAS BEEN WRITTEN and yet little is actually known of the representational art style known rather loosely as that of the Columbia Valley. It occurs sporadically in petroglyphs and pictographs along the course of the Columbia and appears in relief work on bone and stone specimens. Perhaps its most widely recognized examples are to be found in sculptured monoliths.[1] At least one stone bowl is incised with it.[2] Some suggestion has already been made that it relates to basketry design as well,[3] and a basket recently discovered in the British Museum offers proof in support of general ties in design in these various media.

The basketry design pictured here (Fig. 1) is taken from a unique twined bag in the Frier Collection now in storage in the British Museum, London. The collection consists of approximately forty baskets, both coiled and twined. It was acquisitioned at the Museum in 1900 and 1908 but most of the specimens bear tags, apparently written by the collector, giving dates of purchase from the Indians of 1876 and 1878. The care with which the collection was made is indicated by the fact that three Klickitat baskets are tied together with a letter attached saying that the women who made them were dead at the time they were purchased. Dated basketry specimens are rare from this region and this fact plus their relatively great age indicates the general importance of the collection. The particular basket under consideration here bears no purchase date but may be assumed to belong to the same early period since the collection was acquisitioned as a whole and the particular items bear no museum numbers. Most of the baskets in the collection have been used and many are in only fair condition, showing signs of considerable wear and indicating that they were already far from new when they were obtained from the Indians.

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1 For general review of Columbia Valley art style and bibliography see Smith, 1950a, pp. 26-27. The most easily available plates showing the sculpture may be found in Strong, 1945. Paul S. Wingert (1952) has an analysis of the art style of the sculpture in press, and an ethnological analysis appears in Smith, 1946.

2 Heizer, 1942.

3 Smith, 1943.

FIG. 1. Developed design on the Umpqua twined basket, showing large human figures in Columbia Valley art style.

The specimens are also carefully marked as to tribal or areal provenience. Particularly noted were examples from Tillamook, Siletz, Salmon River, Yamhill, Klamath, Klickitat, and Cow Creek. The basket described here is Umpqua.

It is a twined bag approximately seven inches deep and four inches across, proportions which identify it more closely with the coiled berry baskets of the region than with the modern twined bags from Klickitat and Yakima which are wider across than they are deep and considerably larger. The modern bags are reminiscent of knitting bags in shape and quite different from this pouch-like Umpqua specimen. The bag is worn in places and the bottom is cracked, but the design, which is the most significant factor, was accurately reproduced by Mr Gowers. In expanding-sided baskets it is difficult to reproduce the design because the number of stitches increases. In this practically straight-sided specimen, however, the variation in the number of stitches is less of a factor and drawn reproduction is consequently much more satisfactory. Stitches are shown here as drawn on square graph paper, one square to a stitch. This gives some distortion, since the actual stitches are about half again as high as they are wide. The effect of the design is thus more elongated than it appears here in drawn reproduction (see Plate 1). Although the bag is flattened, the design is continuous around the sides. It is, in other words, a true basket in design. The large human figures which dominate it and which are so distinctively Columbia Valley in style are off-center on one side. The only photograph of the basket available shows just a few stitches of these figures at the extreme left of the plate.

Representational designs are not common on Salish coiled ware although they have become familiar on the modern Sahaptin bags mentioned above.[4] They do, however, occur along the Columbia and in the Middle Fraser area. In this distribution the representational designs are seldom human. They are more apt to be insects or floral designs, and have a delicacy which is generally out of keeping with the heavy vigor of much of the geometric design. Twana twined baskets sometimes have animal and human figures, but they are small like the smaller figures represented here and are often used in conjunction with larger geometric patterns. A remarkable coiled basket was once seen by the senior author of this paper among the Puyallup which had human figures its full depth. They must have been fully five inches high but they were in design like the small simplified human figures shown above and to the right of the dominant ones here. No faces were shown and the bodies were the usual solid silhouette. Other baskets from southern Puget Sound occasionally bear human and animal figures similar to those

4 For basketry of the region see Boas, 1928; Farrand, 1900; Mason, 1902; Smith and Leadbeater, 1949.

UMPQUA TWINED BASKET
(From the collections of the British Museum)

described for Twana and also in conjunction with the much more usual geometric designs. None have been seen, however, with the exuberant proliferation of representational design shown on the Umpqua specimen.

In the Frier Collection, with the basket described here, there is also a twined Siletz specimen decorated with alternating human and animal figures, topped by a single line of small diamonds and a continuous band. The animals may be dogs or deer and are small, with simple line bodies. The human figures are interesting in that they have triangular bodies and large, outlined feet sticking out to either side. The heads are also outlined but without faces. All the animals face in the same direction so that the design has movement and one human figure is simplified, without feet and arms, forming what has been called a "stopper" and giving the design the "once-around continuity" found to be typical of some Salish coiled ware.[5]

In brief, then, the Columbia-Fraser basketry tradition is largely in the direction of geometric design. However, a fairly recent tendency toward delicate representational design has been noted by several people for the Middle Fraser and it may be well to distinguish this from another strain of representational design occurring considerably farther south and flanking a broad area on either side of the Columbia. Occasional specimens from Siletz to Twana, and as far up the Columbia strip as Sahaptin territory, bear human and animal figures as design elements. They are done in heavy silhouette, and floral designs are conspicuous by their absence. These two representational styles seem to be fairly distinct and to have separate distributions. It is notable, however, that they meet in the Middle Columbia area.[6] It is the Middle Columbia, also, which yields a large proportion of the objects decorated in Columbia Valley style, and there seems little doubt that some sort of stimulus center was located in this general region.

No great age has ever been claimed for the Columbia Valley art style. Although specimens have been found archaeologically, they have been generally attributed to the protohistoric period when any approximation of dating was possible. The style has several times been associated with figures mounted on horseback and, although these could quite easily antedate direct European contact, they could not go back much earlier than the middle of the eighteenth century.

5 See Smith and Leadbeater, 1949.

6 The Middle Fraser has been defined as lying approximately between Yale and Mission on the Fraser River (Smith, 1950b, p. 335). The Middle Columbia centers in the general Dalles-Deschutes region of the Columbia River (see Strong, Schenck, and Steward, 1930) and has been archaeologically described as the Deschutes-Willamette Phase of Eastern Stone (Smith, 1950a, p. 32). It should be particularly noted that Umpqua is contiguous with the western or Willamette limits of the region thus suggested.

The appearance of mounted figures on our unique specimen certainly refers to a later period. Even if our dating was not so well established as being between the third and fourth quarters of the nineteenth century, the appearance of the three large birds definitely suggest late ties with patriotic Americans. The American eagle is, as a matter of fact, one of the most popular motifs on twined bags today and seems to be foreshadowed here.

The more striking thing in our specimen is that the dominant human figures are so out of keeping with any basketry design tradition of the area and so clearly reminiscent of designs in bone and stone. Whether the wavy body lines were intended to suggest the rib marks so typical of figures in the Columbia Valley art style it is not possible to say. But the elaborate facial treatment and the development of a hair or cap area is remarkably similar when one considers the differences in medium and associated technique. Even the detail of the upside-down face recurs on the incised stone bowl described earlier by Heizer. The amazing thing is that so much of what has been thought of as an early art tradition persisted so late.

Little or nothing is known ethnologically of the Columbia Valley art style. Possibly it should be pointed out that lizard-like figures not unlike those of our specimen are frequent in both stone and wood carvings of the Fraser drainage. Not only does our basket from the Frier Collection relate earlier and later design styles to each other, but, in the good Middle Columbia tradition, it serves as a link between the upper Columbia and Fraser and the lower Columbia materials. The recurrence of the same design elements in various media would certainly warrant more intensive study and, if the bits of data continue to accumulate, a thorough study of this tantalizing art style may eventually be feasible.

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CAROLINE ISLAND BELT WEAVING

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THE OCCURRENCE and absence of loom weaving in the islands of the Pacific has long been a problem of interest to Oceanists. The authors, having at their disposal a small collection of fabrics of the finest type from Micronesia, here present a discussion of the general occurrence of loom weaving and fabric designing in the Pacific with the Caroline Islands as the focal point.

The basis of the technical part of our study is a collection of twenty-four narrow fabrics from the Caroline Islands, called belts for the sake of convenience, in the Museum of Anthropology at the University of California, and an heirloom belt from Ponape belonging to the senior author. While this is but a small sampling of such textiles known to exist in museums, they are indubitably an absolute norm for the types they represent.

Our paper is divided into three major sections. The first is a general consideration of the weaving craft in Oceania as viewed from the Caroline Island locale by Saul Riesenberg; the second is an analytical description of the fabrics and designs by A. H. Gayton. Both authors have contributed to the concluding section.

WEAVING IN OCEANIA

Loom weaving in the central Pacific is confined to the Caroline Archipelago and to some of the islands on the northern fringe of Melanesia. It is absent from the rest of Micronesia and Melanesia and, eastward, from all of Polynesia proper. But westward it occurs in virtually all of Indonesia. The Pacific distribution of weaving technique and loom type indicates that the basic instruments of the craft spread from a southeast Asiatic source through Indonesia into the Carolines and thence into northern Melanesia.

The Caroline Island loom is a horizontal tension backstrap loom. The warps are led in a continuous spiral around two beams, producing a ring-woven fabric. Attached to the ends of the breast beam (nearest the worker) is a strap which passes around the back of the weaver and against which she leans to tense the warps. Between the breast beam and its opposite, the warp beam, there are in sequence—in the upper plane of the warps—the heddle, shed roll, and lease rod. Adjunct tools are a bobbin carrying the weft, and the battening sword; in addition there may be pattern sticks and a brocading awl. This form of loom is one of the

types found in parts of southeast Asia and much of Indonesia; it is the only form in the Pacific.[1]

In the Caroline Islands the loom is absent only on Palau and three or four Central Caroline Islands which obtain their woven articles in trade.[2] The two Polynesian outliers in the Carolines, Nukuoro and Kapingamarangi, provide a geographical link with the Polynesian outliers in Melanesia which also have or had the loom: Nuguria, Taku, Nukumanu, Ontong Java, Sîkayana, and Tikopia. Elsewhere in Melanesia weaving occurs (or occurred) at Matema and Ndeni in the Santa Cruz group, at Santa Maria in the Banks Islands,[3] at Santo in the New Hebrides, west of this area in the St. Matthias group (Mussau, Emirau, Tench), and again in the Takar-Saar coasts of Netherlands New Guinea (the Jobi region, Sarmi, and the islands of Kumamba, Wakde, and Jamna)[4] (Figure 1).

Actual form of the loom parts is significant in consideration of the distribution of the loom throughout the area. In Indonesia ring-weaving is usually associated with cylindrical beams, in order to facilitate revolving the upper plane of the fabric forward as the work progresses beyond the reach of the weaver, whereas, for the most part, board-shaped beams are found with open-warp weaving. In the Pacific, however, exclusive use of cylindrical breast and warp beams occurs only in the Takar-Saar area, on the narrow-fabric loom of St. Matthias, on the Polynesian outliers Nukumanu and Taku, and on the Yap open-warp loom. Santa Cruz and Banks beams are cylindrical also, but are squared at the center where the warps pass around them. The warp beam is always cylindrical on the Polynesian outliers Nuguria and Ontong Java, and on the wide-fabric loom of St. Matthias, while on these islands the breast beams may be of this shape but also may be square at Nuguria, squarish at Ontong Java, and board-shaped at St.

1 There is one exception: the "money cloth" loom of Yap, on which excessively long warps (30-100 Klafter according to Müller) are horizontally stretched between breast and warp beams, and are supported by intervening bamboo trestles. The warp is in one plane (not a ring warp). As work progresses, the fabric is rolled up on the breast beam, the supports and opposite beam being moved forward as the warps become shorter. The finished cloth is rolled up in coconut leaves and tied with rope, the rolls being a form of currency. An identical type of loom is known in rural China and India (Little, 1902, p. 62; photographs from Klein and Reyerl, Madras).

2 Losap and Nama apparently never have had the loom (Krämer, 1935, p. 145; Kubary, 1895, p. 61; Finsch, 1914, p. 433). A number of other islands which formerly had the loom have given up weaving. Nauru, outside the Carolines, is said by Hambruch (1914, p. 81) to have had weaving, but Kayser (1917-18, p. 334) disproves this theory.

3 Rivers (1914, vol. 2, p. 379) suggests also that weaving was once present at Ureparapara and Rowa in the Banks Islands.

4 Sources for distribution of the loom: Ephraim, 1905, p. 58; Finsch, 1914, pp. 429-431, 440; Nevermann, 1938, p. 15; Parkinson, 1898, pp. 117, 118; Parkinson, 1907, pp. 544-548; Roth, 1918, p. 106; Wedgwood, 1927, p. 46.

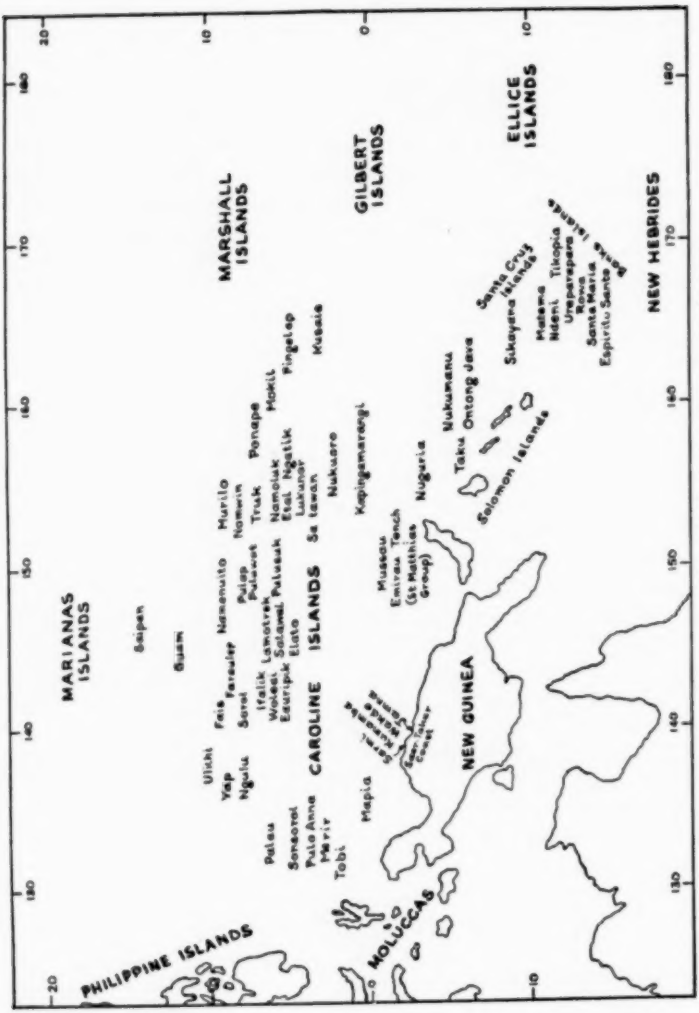


Fig. 1. Schematic map of the islands cited in the accompanying paper.

Matthias. The two beams may take either the cylindrical or square shape at Sikayana, cylindrical or board-shape on the Yap closed-warp loom. All these Pacific cases, except Yap, are Melanesian or on the Melanesian periphery.

The warp beam is either cylindrical or board-shaped, the breast beam board-shaped, on Ponape, Kusaie, Nukuoro, and Kapingamarangi. The last two islands may have also square breast beams, and in Kapingamarangi the warp beam may further be square or hexagonal.

The warp beam is board-shaped or square, the breast beam square, on Lukunor and Pulusuk. Lukunor sometimes has cylindrical or board-shaped breast beams. On Truk the beams are often both squarish, as they are on Namonuito.

Apart from these cases, all loom beams elsewhere in the Carolines are board-shaped.[5]

The lease rod may be single, in which case it is wound about by each warp in a complete turn. If a pair of lease rods is used, these are inserted under alternate opposing warps; the pair is then squeezed or tied together. (Either method holds the warps in firm separate position.) Both forms occur in Indonesia and on Kusaie, Ponape, Kapingamarangi, Lukunor, and Pulusuk—all islands in the eastern half of the Carolines. A combination of the two forms on the same loom occurs in the Central Carolines, on Woleai, Faraulep, and Elato, and possibly also on Fais, Sorol, and Lamotrek. Single lease rods occur in the remainder of the archipelago, as well as at Takar-Saar and St. Matthias. Elsewhere in Melanesia (Nuguria, Taku, Nukumanu, Ontong Java, Sikayana, Santa Cruz, Banks Islands) only the pair is found.

Swords (battens) are of two principal types: single-edge and double-edge. The former type is found almost exclusively in Indonesia and, with one exception (Sonsorol), in the western part of the Carolines as far as Elato and Lamotrek. Both forms occur on Lukunor and Kapingamarangi. The double-edge form occurs from Pulusuk-Puluwat eastwards, including Nukuoro, and in all the Melanesian

5 Sources for beam, lease rod, and sword types: Chinnery, 1925a, p. 79; Chinnery, 1925b, p. 200, pl. 42; Damm, 1938, pp. 170, 247, 322, figs. 142, 221, 247, 344, pl. 13; Damm and Sarfert, 1935, figs. 195, 196; Eilers, 1934, pp. 109, 111, 258, figs. 45, 70, 152, pl. 6; Eilers, 1935, pp. 291, 405, figs. 106, 204; Eilers, 1936, pp. 189, 190, fig. 145, pl. 8; Ephraim, 1905, pp. 59, 60, fig. 53; Finsch, 1893, p. 221; Girschner, 1912, p. 158; Graebner, 1909, pp. 105, 123, fig. 53; Hambruch and Eilers, 1936, p. 383, figs. 174, 175; Hiroa, 1950, p. 158, fig. 97; Krämer, 1932, p. 198, fig. 169, pls. 19, 21; Krämer, 1935, pp. 62, 266, fig. 97, pl. 20; Krämer, 1937, figs. 45, 46, 49, 114, 171, pls. 4, 11, 17; Kubary, 1895, pp. 60, 95, 109; Kubary, 1900, p. 128; Le Bar ms.; Müller, 1917, pp. 109, 110, 115, figs. 161, 165, pls. 30, 31; Nevermann, 1933, pp. 134, 135, figs. 85, 86, 89, 90, pl. 9; Nevermann, 1938, pp. 232-253, 294, 297, 300, 301; Parkinson, 1898, pp. 207, 208; Parkinson, 1907, fig. 98; Roth, 1918, pp. 96, 97, 102, 105, figs. 155-157, 165; Sarfert, 1919, fig. 73; Sarfert and Damm, 1929, pp. 174, 175, fig. 232; Schmeltz and Krause, 1881, pp. 326, 345, 346, 378.

islands for which information is available. In Lukunor, Kapingamarangi and Melanesia (Nuguria, Nukumanu, Ontong Java, Santa Cruz, Banks) the double-edge form often has only one point, the other end being squared off or provided with a handle. A keel-like ridge along the length of the sword is seen on specimens from Lukunor, Nukuoro, Kapingamarangi, Santa Cruz, and Banks Islands.

The bobbin is of the same type for most of the area being considered, and is quite like the netting needle ("shuttle") common throughout Oceania. But a form in which the body, around which the weft is wound, is left open or carries large perforations, occurs occasionally at Pulusuk, Nukuoro, and Kapingamarangi (Carolines) and Sikayana and Santa Cruz (Melanesia).

The warping bench is a special development peculiar to the Caroline Islands of Ponape, Kusaie, and Kapingamarangi. Its purpose is to support the vertical posts on which the warps are wound before they are transferred to the loom. In Ponape and Kusaie islands a flat-topped beam is mounted on posts or legs, while the Kapingamarangi form has low transverse feet. A rectangular board placed directly on the ground serves the same purpose in the St. Matthias group. Both the bench and the board type are found widely distributed in Indonesia. Elsewhere in Indonesia and in the Pacific the warping posts are driven into the ground, and in Santa Cruz the loom elements themselves (beams, heddle, and shed roll) function first as warping posts in the ground before being mounted as a loom, thus eliminating the duplicate sets of substitute posts. The measuring grid, which is associated with the warping bench on Ponape and Kusaie, occurs only there.[6]

Everywhere in the Oceanic weaving area warp threads run the full length of the fabric without changing color except for the special Carolinian style. If decoration occurs at all, striping is the usual form, and is achieved by knotting on a new color of yarn during the preparatory winding of the warps; the same color may be used for several successive complete revolutions of the warp. This is the type of weave we have called Class A herein (Figure 2, top). Warp stripes of varying widths are found in most of the Carolines, and at Takar-Saar and in St. Matthias. In Sikayana colored warp yarns are used singly, rather than in

6 Sources for perforated bobbins and warping bench: Eilers, 1934, p. 111, figs. 71, 154; Ephraim, 1905, fig. 51; Finsch, 1893, pp. 474, 475; Finsch, 1914, pp. 431, 435; Hambruch and Eilers, 1936, fig. 173; Hiroa, 1950, pp. 151-155, figs. 90-94; Nevermann, 1933, p. 132; Nevermann, 1938, pp. 239, 245, 251, 252; Roth, 1918, p. 96, figs. 155, 156; Sarfert, 1919, fig. 85; Schmeltz and Krause, 1881, pp. 279, 345.

Lesson (1839, p. 526) says that Pingelap cloths in their weaving, variety of design, and lively coloring were in no respect inferior to those of Kusaie; the art of weaving has long been extinct on Pingelap, and loom and fabrics are not described in detail in any source. But Lesson's statement suggests that the Kusaie-Ponape techniques were once practised there, which implies the presence of the warping bench and measuring grid.

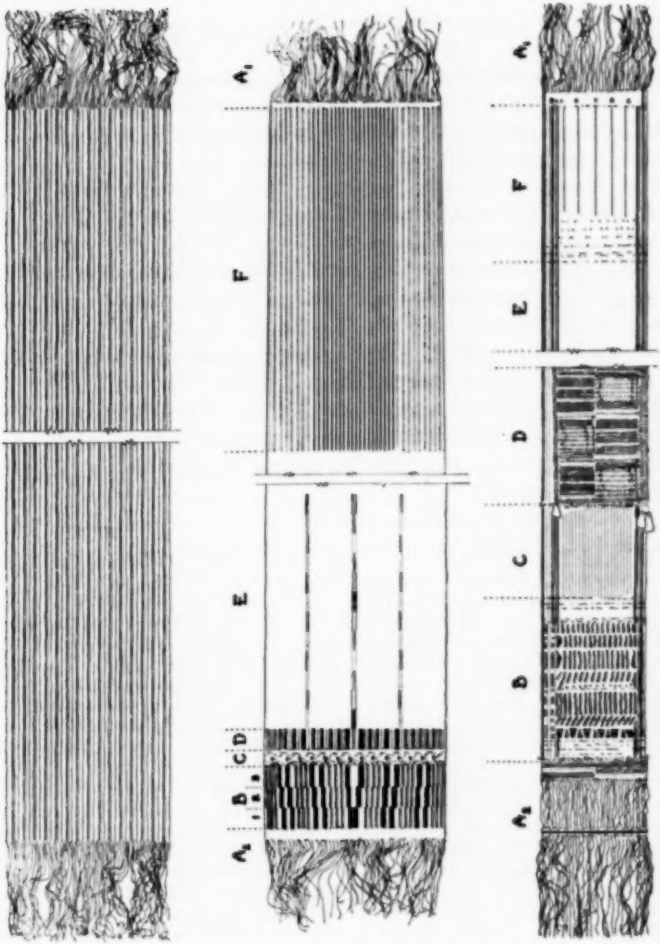


FIG. 2. Caroline Islands belts. *Top:* Class A, plain weave striped belts, Kusaie. *Center:* Class B, warp-knotted design belts, Kusaie. *Bottom:* Class C, bead encrusted belts, Ponape.

groups. Warp-striping is absent, however, in parts of the Southwestern Carolines (Tobi, Pulo Anna) and in two Central Caroline islands (Namonuito, Puluwat), as well as on Nukuoro, Kapingamarangi, and all of the Polynesian outliers in Melanesia.[7]

Incremental color changes within a warp length are used in an elementary fashion on Lukunor, Satawan, and Namoluk in the east Central Carolines. There a colored, striping warp may have a second color added to its end to create a change in the fringe portion. We call this Class Sub-B.[8]

Only on Kusaie and Ponape (Eastern Carolines) occur the weaves with knotted-in designs which we have called Class B (Figure 2, center). Here color changes are made at any point desired in the warp length, often resulting in variable design bands across the width of the fabric. Such bands occur nowhere else, although rudimentary forms of this technique appear on Lukunor, Satawan, and Namoluk in the Central Carolines.

The use of shell discs applied while weaving, as described below as Class C type, is apparently unique for Ponape (Figure 2, bottom; Plates 2, 3). On Truk red shell disc beads are sewed around the neck hole of the woven poncho; they are arranged in rows which may continue down the front of the garment, often branching into rows on either side. The discs are laid so they overlap like shingles, as in our Ponapian weaves.[9]

Pattern weaving, by means of floating warps over several wefts, is described below for the Ponape and Kusaie fabrics. This effect is achieved by pattern sticks

7 For Pulusuk and Sonsorol, Nevermann (1938, pp. 233, 239, 302) and Eilers (1935, p. 117) deny warp-striping, and none appears in any plates. But Schmeltz and Krause (1881, p. 304) mention stripes for Pulusuk, and Finsch (1914, p. 431) reports for Sonsorol stripes similar to those of Lord Howe (Ontong Java). Ontong Java and Nukumanu may formerly have had striped cloth (Sarfert and Damm, 1929, pp. 91, 176; Nevermann, 1938, p. 250). Another Polynesian outlier, Tikopia, is said by Finsch (1914, p. 440) to have had weaving like Woleai, which does have stripes. Finsch (1893, p. 585; 1914, p. 434) claims narrow white warp stripes formerly occurred on Kapingamarangi. No museum specimens or illustrations from any of these islands show such stripes, and the present authors do not include them in their historical reconstructions.

Sources for presence and absence of striping: Chinnery, 1925b, p. 198, pls. 41-43; Damm, 1938, pp. 23, 123, 170, 236, 321, figs. 141, 221, pls. 2, 4, 8, 12, 13, 22, 24, 32; Damm and Sarfert, 1935, pp. 42, 43, pls. 18, 19; Eilers, 1934, p. 112, pl. 7; Eilers, 1935, p. 291; Eilers, 1936, p. 221, pls. 3, 4; Finsch, 1893, p. 585; Finsch, 1914, pp. 432, 433, 438; Girschner, 1912, p. 159; Graebner, 1909, figs. 53, 54; Hiroa, 1950, p. 165; Krämer, 1932, p. 189, pls. 20-22; Krämer, 1935, pp. 62-66, 255, 265, pls. 6, 7; Krämer, 1937, pp. 76, 77, 247, 248, 340, 343, 345, pls. 6, 7, 12, 20, 22; Kubary, 1880, pp. 267-268; Müller, 1917, pl. 32; Nevermann, 1933, pp. 81, 137-139, figs. 85, 86, pl. 9; Nevermann, 1938, pp. 233-253; Parkinson, 1907, fig. 98; Sarfert and Damm, 1929, pp. 91, 176; Schmeltz and Krause, 1881, pp. 302-306.

8 Krämer, 1935, pp. 62-64, 66, pls. 6, 7; Kubary, 1880, p. 268.

9 Krämer, 1932, p. 92, pls. 1, 2, 6, 9.

on Kusaie, Ponape, Fais, in the Southwestern Carolines, and elsewhere. One or more heddles are used for the same purpose on Truk, Woleai, Lamotrek, Eauripik, and Ulithi, while these or some other means of selecting special sheds appear to be used in virtually all of the Carolines. Such devices are lacking on Yap, Nukuoro, and Kapingamarangi and apparently everywhere in Melanesia, with a concomitant lack of the technique.[10]

Brocading—the addition of extra wefts to form a decorative motif on the surface of a cloth—is not restricted to Ponape and Kusaie, though it is not a universal technique in the Carolines, being absent at least at Namonuito, Pulusuk, and Kapingamarangi. Usually the addition is made with aid of an awl (or an eyed-needle on Fais and Tobi), and the wefts are single threads just the width of the cloth. On Yap a bobbin is sometimes used and the extra weft continues from shed to shed; this is on ring-woven fabrics. Brocading does not occur outside of the Carolines; the only Polynesian outlier which practises it is Nukuoro, in the Carolines. Embroidery, which only superficially resembles brocade, is added to finished textiles on Tench in the St. Matthias group and at Santa Cruz.

In most Micronesian loom-made textiles the ratio of length to breadth is much closer than those analyzed in this paper.[11] The widest webs are found on Truk, where proportions of women's sarongs may be as low as 1.9 to 1. The men's breechclouts are almost as wide, being folded several times. Throughout

10 Sources for the presence and absence of pattern weaving and brocading (from authors' statements, inferences, and illustrations of looms and fabrics): Damm, 1938, pp. 23, 43, 170, 171, 236, 321, figs. 66-85, 141, 221, 344, pls. 8, 12, 13, 22, 32; Damm and Sarfert, 1935, pp. 43, 80, pls. 18, 19; Eilers, 1934, p. 112, pl. 7; Eilers, 1935, pp. 117, 152-154, 190, 290, 291, figs. 34, 202, 203, pl. 1; Eilers, 1936, pp. 140, 189, 221, pls. 3, 4; Ephraim, 1905, fig. 53; Finsch, 1893, p. 585; Finsch, 1914, pp. 432, 433, 440; Graebner, 1909, figs. 14, 53; Hambruch and Eilers, 1936, figs. 68-92; Hiroa, 1950, p. 165; Krämer, 1932, pp. 189-193, 214, fig. 169, pls. 20-22; Krämer, 1935, pp. 61-66, 255, fig. 97, pls. 6, 7, 9; Krämer, 1937, pp. 76-82, 247-250, 340-344, figs. 17, 49, 115, 171, pls. 6, 7, 12, 20; Kubary, 1895, pp. 60, 95, 109; Müller, 1917, pp. 114-117, pls. 32, 33; Nevermann, 1933, p. 139; Nevermann, 1938, pp. 233-253, 302; Parkinson, 1907, p. 343; Roth, 1918, fig. 171; Sarfert, 1919, pp. 185, 186, 192, 193, pl. 26 (2); Sarfert and Damm, 1929, p. 176; Schmeltz and Krause, 1881, pp. 303-305, 357, 358, 381, 390, 393.

11 Sources for length-breadth ratios: Chinnery, 1925a, p. 79; Chinnery, 1925b, p. 196; Christian, 1899, p. 397; Damm, 1938, pls. 2, 8, 12, 22, 32; Damm and Sarfert, 1935, pp. 42, 43, pls. 18, 19; Eilers, 1934, fig. 70, pl. 7; Eilers, 1935, pl. 1; Eilers, 1936, pp. 140, 221; Finsch, 1893, pp. 222, 481, 529, 583, 591; Finsch, 1914, pp. 431-439; Graebner, 1909, fig. 54; Hambruch and Eilers, 1936, figs. 68-92; Hiroa, 1950, pp. 151, 154, 165; Krämer, 1932, pp. 190-194; Krämer 1935, pls. 7, 20, 22; Krämer, 1937, pp. 249, 250, pls. 6, 7, 26; Kubary, 1880, p. 267; Kubary, 1895, pp. 91, 109; Müller, 1917, pl. 32; Nevermann, 1933, p. 81, figs. 85, 86, 89; Parkinson, 1897, pp. 117, 118; Parkinson, 1907, p. 544; Sarfert, 1919, pls. 29-34; Sarfert and Damm, 1929, figs. 51, 52; Sarfert and Damm, 1931, pl. 57; Schmeltz and Krause, 1881, pp. 118, 278, 291, 292, 302, 303, 335, 357, 381, 382, 393.

the Central Carolines garments run not much narrower than this, the narrowest occuring on Woleai, where the range is 3.7:1 to 4.5:1. On Yap, to the west, slightly narrower fabrics are found, the range going to 5.3:1. Similar proportions are found, for sarongs only, in the Polynesian outliers and at St. Matthias. Narrow breechclouts occur in the Southwestern Carolines, the proportions being as much as 11.7:1 on Tobi and 16:1 on Sonsorol (in these islands the woman's sarong is a plaited, not woven, article). On Nukuoro, the Polynesian outlier in the Carolines, the breechclout is about 9:1 in its length-breadth ratio, and a similar figure seems to hold for the men's garments in other Polynesian outliers in Melanesia: the proportion for Nukumanu, for example, is 10.8:1. At Santa Cruz the range is great for men's garments (3:1 to 13:1), while in the St. Matthias group, in contrast to sarongs, men's belts are extremely narrow (16:1 to 31:1). Kusaie proportions run from 6.9:1 to 10.3:1, and those of Ponape are 10.6:1 to 19.2:1.

Everywhere in the Carolines, with two exceptions, weaving is a feminine task. In one of the two Polynesian islands, Kapingamarangi, it is done by men. In Yap either sex may make ordinary cloth on the backstrap, ring-warped loom, but only men work on the extended loom; no doubt this is in response to prestige patterns associated with money cloth. Where information is available, weaving is a male prerogative in the Polynesian outliers in Melanesia and on Santa Cruz. But in the St. Matthias group and on Sikayana the women weave. Weaving by men is extremely rare in Indonesia.[12]

TEXTILE AND DESIGN ANALYSIS

The total effect of a textile, giving it a quality called style, has three major components: (1) the nature of the *fiber* used in the yarns, (2) the *color* of these yarns, and (3) the *weave* or structuring of the yarns into a fabric web. All these interplay in an effect of dullness or glossiness in the yarn surface, the lack or elaboration of color as introduced in design and more or less controlled by the mechanics of the weave, and the textural quality of the weave itself—smooth, perhaps, or bumpy—in the criss-crossing of the warps and wefts.

12 Sources for sex of weaver: Chinnery, 1925a, pl. 55; Chinnery, 1925b, pls. 41-43; Damm, 1938, pp. 247, 321, pl. 13; Damm and Sarfert, 1935, pp. 79, 145; Eilers, 1934, pp. 68, 109, 257, 258; Eilers, 1935, pp. 152, 395; Eilers, 1936, pp. 189, 233; Finsch, 1893, p. 473; Finsch, 1914, pp. 432, 438, 439; Girschner, 1912, p. 131; Hambruch and Eilers, 1936, p. 383; Hiroa, 1950, p. 148; Krämer, 1932, fig. 169; Krämer, 1935, pl. 20; Krämer, 1937, pp. 74, 247, 342, 343, fig. 114; Kubary, 1880, p. 267; Kubary, 1895, p. 95; Kubary, 1900, pp. 107, 127; Müller, 1917, pp. 109, 115; Nevermann, 1933, p. 134; Nevermann, 1938, p. 278; Parkinson, 1898, pp. 194, 195, 207, 208; Roth, 1918, p. 101, fig. 157; Sarfert and Damm, 1929, p. 173.

The native fiber used in the belts here considered is exclusively from a plantain of the general type known as "Manila hemp" (*Musa textilis*). The natural pale straw-colored fibers when formed into yarn have a high sheen and a springy flexibility; cut ends or fringing will tend to curl collectively and want their own way if not bound by weft crossings.

Two introduced fibers, cotton and wool, appear in limited quantity as decorative yarns. Cotton, apparently indigo-dyed, is used for brocading. In one Kusaien fragment red wool is used for brocading; red and yellow wool are similarly used in the Ponapean belt. The Ponapean belt, which has a bold red fringe of wool, clearly shows the yarns to have been raveled from red wool cloth.[13]

In the matter of color there is a greater range than in fiber. But which or how many of the colors used in the collection at hand are of native dyes or of European source, it is impossible to tell without laboratory analysis. These colors are probably wholly native: a rust red, a yellow, and an off or untrue black.[14] Other colors, e.g., blue, purple, green, pure red, and of course, the flannel red, all look suspiciously artificial or aniline. However, inasmuch as dyes were highly developed in the Indonesian area, diffusion of dye knowledge into Micronesia may have followed other elements of the weaver's art from that direction.

The weaves in the belts are simple enough technically, being limited to plain weave (over 1, under 1), pattern weave (warp-float), and brocade (extra weft). The plain weave is warp-face—wherein the warp elements greatly outnumber the wefts—and composes roughly ninety percent of all the fabrics. The use of pattern and brocade weaves is extremely limited in Kusaie and Ponape, although on the latter island fairly complex motifs have been rendered in brocade.

While even within this not great range of fibers, colors, and weaves, permutations of the possibilities could evolve complexly styled and varied fabrics, the Caroline Islanders did not extend their textile art in that direction. The unique styles of Kusaie and Ponape mainly result from exploitation of only two processes: knotting of warp lengths to produce color variation (a pre-weaving process), and adding beads onto a brocading weft. Both features, exceptional in weaving procedures, have been carried to a point of virtuosity.

The Caroline Island belts group into three style categories: Class A, plain

13 Raveling a foreign cloth to obtain the valued yarn for reweaving in accordance with local styles is not unusual; for example, this was done by Late Kingdom Egyptian weavers, the Ashanti, the Navaho.

14 Dye materials and methods are described in Christian, 1899, p. 158; Finsch, 1893, p. 474; Sarfert, 1919, pp. 175, 176. The red dye yields varied shades. Color range of *Musa textilis* (and probably other varieties) is from "practically white" through creams, yellows, ochres, to reds and browns (Weindling, 1947, Table 8, p. 50).

woven striped belts; Class B, plain, pattern, and brocade woven belts with knotted-in designs (Sub-B is a rudimentary variant, possibly proto-B), and Class C, belts basically similar to Class B, but having bead encrustation. While Class C is represented here by but one example, it is a well-known type characteristic of Ponape.[15]

The preparation of yarns, warping method, and loom set-up are essentially the same for all three types of Caroline Island belts. One description of these steps will serve as an introduction to all.

The yarn, prepared from split fibers of the banana,[16] is not spun. It is characteristic of this plantain fiber that it may be split longitudinally to an almost infinite degree, thus permitting yarns of extreme fineness to be made if so desired. Fiber lengths range around three feet; this is an estimate. The yarns in all the belts are made of what is nominally a single ply. Yet this "single" ply warp (or weft) is actually a group of four to six filaments slightly twisted together by rolling on the thigh and as a group knotted end to end to form a continuous yarn. Individual filaments in specimens examined were all of a fineness equal to or greater than No. 100 cotton sewing thread; the yarn itself varied from equivalents of No. 12 to No. 16.[17] Thus the yarn is not made by true spinning, which is a process of overlapping and spiralling individual fibers so tightly that they will not pull apart under tension.

The exact method of knotting the fiber lengths together, either to form yarnage or to change color in the warp yarn is not altogether clear. The extreme brittleness of the fibers makes it almost impossible to unflex the tiny, tightly compacted yarn knots. Analysis revealed at least four types: two may be incorrectly deduced or may be variants which occur in the Class A fabrics. The other two types also appear in Class A: one of these, analyzed by Krämer-Bannow, occurs in the Class B fabrics, and the other, analyzed by Gayton, is in the Class C belt from Ponape[18] (see Figure 3a).

The plantain yarns of the Carolines, like the hibiscus yarn of Kapingamarangi and other Micronesian islands, depend wholly on knotting to attain longitude.[19]

15 Examples are shown in Hambruch and Eilers, 1936, pp. 286-295, pl. I (3).

16 One of the *Musa*, perhaps *paradisica*, *textilis*, or *ticap*; several varieties grow in Oceania (Matthews, 1924, pp. 809-815; Nevermann, 1938, pp. 27-30).

17 Yarn diameters in ten Class A specimens were determined by Dwight Wallace, Preparator at the Museum of Anthropology, University of California. A vernier sliding caliper gave yarn sizes ranging from .3 to .35 mm, individual filaments as .1 mm.

18 Krämer-Bannow, in Sarfert, 1919, p. 174. The Ponapean knot is like that of Kapingamarangi (Hiroa, 1950, p. 150, fig. 89).

19 A common method wherever plantain fibers are used, e.g., in the Philippines (Minier, 1913, p. 285).

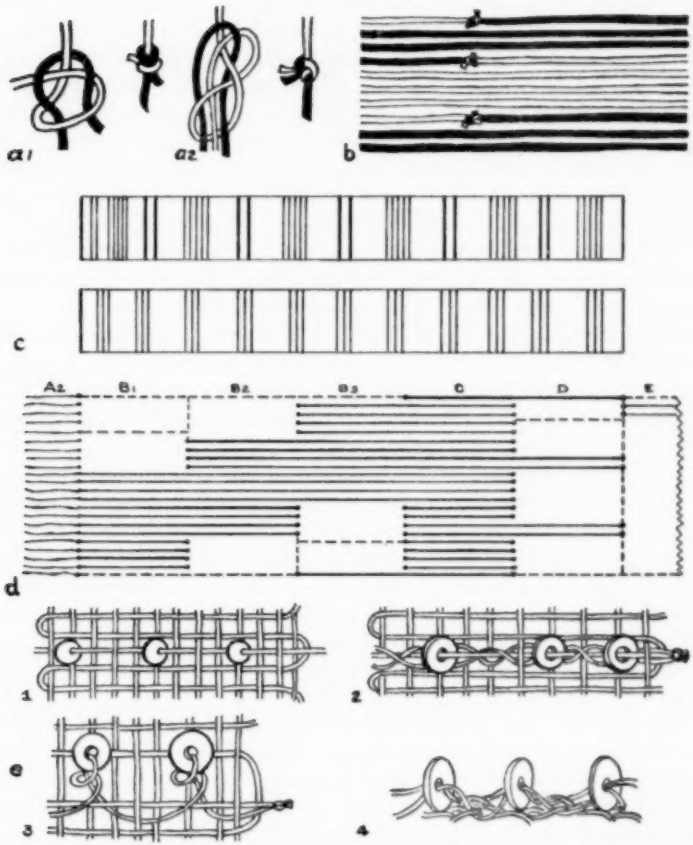


FIG. 3. Schematic drawings of techniques. *a1*, knot of Ponape; *a2*, knot of Kusaie (after Krämer-Bannow); *b*, knotting of warp stripes; *c*, examples of warp stripe groupings; *d*, yellow warp carried through several design sections; *e*, methods of adding beads: *1*, glass beads; *2*, shingled shell discs; *3*, vertical shell discs; *4*, shingled shell discs along warps.

It is this characteristic, plus a preference for warp-face weave, which gives the clue to the unique designing of Kusaie and Ponape belts.

The arrangement of warps on the loom is that known as "ring warp": a continuous strand of yarn passes successively around the front and back beams of the loom, progressing in a flattened spiral from one end of the beams toward the other until the desired width of the future cloth has been attained. The warps when so arranged have an upper and lower plane, and the weaving operation takes place on the upper one. As the warps close to the weaver are filled with weft, forming the web, the work is pulled toward the weaver; the whole band of warps, whether woven or as yet unwoven, slips around the loom beams as around rollers. When weaving has progressed to within a few inches of complete filling of the warps, the work ceases, and the unwoven warps, when cut at the center point, form fringes at each end of the belt.

Laying out of the warps (before being placed on the loom) is done on a warping bench in which short vertical posts substitute for the actual loom parts (warp beams, heddle, and shed roll; lease rod also sometimes) which eventually will be inserted in their proper positions in the warp ring.[20] The warp yarn is wound around and around the posts continuously, the incremental gain on each round being very small because of the fineness of the yarn.

If a striped warp is wanted (as in the Class A belts) it is necessary to make the color change in the continuous warp as it travels around the warp posts (Figure 3b). Thus, in the simplest way the knotting-in of color is established as a pre-planned designing technique. Any of these striped belts will show the line of knots for the color change, usually across one fringe, since weaving is started and finished so that the knotting-in of the colors will be in the unwoven warp section. A perfect example of this is specimen 11-198 in which the warps were never severed to open the ring-woven fabric.

The step from such a relatively unsophisticated stripe patterning to the complex ornament of Class B belts is only one of creative resourcefulness and finer control of a technique already realized in essence. It is even conceivable that the use of composite patterning grew out of errors in knotting for color stripes, or from a shortage of correctly colored yarns for full length stripes, resulting in an uncalculated polychrome pattern which suggested new design possibilities in the knotted-in technique.

Whatever the reason, the step between knotting-in colored stripes and the creation of complicated patterns by the same method, is exemplified by fabrics

20 This process has been fully described and illustrated elsewhere, though perhaps most effectively by Hiroa (1950, pp. 151-156). See also Sarfert, 1919, pp. 164, 167, 168.

from the Central Caroline islands, Lukunor, Satawan, and Namoluk. Lukunor and Satawan weavers place black stripes in a white background; at Namoluk they use red stripes as well. In the black stripes one or sometimes two successive warps change near the ends of the cloth to white, by means of knotting. This may occur several times in a single black stripe, and it is repeated in all the black stripes. In the laying out of the warps the ends of each of the short white threads are knotted to the black threads in approximately the same places on the turns around the warping posts. The section of the ring web which is left unwefted, and which later is to be cut to form the fringes when the cloth is opened out, lies in the middle of the white lengths. Thus, after cutting, there will appear towards both ends of the completed fabric, the occasional white threads in the black stripes, all of about the same length.[21] This intermediate style of knotted-in designing we have called Class Sub-B.

Class A: Plain Weave Striped Belts.[22] Since there is little distinction within this group—the chief variable being in color choice and grouping for stripes—overall description of technical features will suffice.

Lengths of the belts including fringe (total warp length) range from 42 inches to 54 inches, with the mode (4) falling at 50 inches, the mean at 48.6 inches. Widths vary much less: 6 or 7 inch widths tend to coincide with shorter and longer belts respectively, but between the four longest belts with a 7 inch width, and the three shortest with a 6 inch width, there is a scattering of width dimensions in relation to length. The variation in width is so slight as to appear constant when a whole group of belts is seen at once.

Fringe lengths show no clear relation to web length, longer belts often having shorter fringes than smaller belts. Since the length of the fringe is only de-

21 Description of Lukunor and Namoluk fabrics provided by Saul Riesenberg. In the Museum of Anthropology, University of California, five textiles of only "Caroline Islands" provenience have short lengths of yellow knotted into black stripes in such a way as to have the new color in each end and fringe of the web when cut open (specimen nos. 11-298, 11-304, 11-561, 11-562, 11-563).

22 Nineteen examples: Museum of Anthropology, University of California, specimen numbers: 11-186, 11-187, 11-189-202, 11-568 11-569, 11-571. The technical analysis of these fabrics was made by students in a graduate seminar directed by Gayton: Gottfried Berger, Frederick Blodgett, Richard Fiscus, Ralph Higbee, and Willis Kauffman. Their findings have been condensed for publication purposes.

The specimens, a gift of Mrs Phoebe A. Hearst, were acquired from a dealer in San Francisco in 1901 and assigned "Nukuor or Gilbert Islands" as provenience. There was no weaving in the Gilbert Islands, nor textiles of this type made in Nukuoro. Since the 19 pieces are identical in style with those of Kusaie as illustrated by Christian and Sarfert, we have had no hesitancy in assigning them to that provenience. (See Christian, 1889, pp. 394, 397, 398; Sarfert, 1919, pl. 16 (1), showing men's striped breechclouts.)

termined by the weaver's whim in ceasing to weave a solid web—leaving a space of unwoven warps to be cut as fringe—such irregularity is perhaps expectable. While webs of 45 or 46 inches have fringes of 8 or 6 inches, and webs of 38 and 37 inches have fringes of 4 and 7 inches, one of 40 inches has a 10 inch fringe, while its next neighbor in length, 41 inches, has but a 4 inch fringe. Two 45 inch belts have fringes of 8 and 5 inches; two of 38 inches, fringes of 9 and 4 inches. Owing to curling of the fibers, accuracy of fringe (and over-all) measurements is not perfect, but this variable factor is equal for all specimens.

Yarn counts, that is, proportion of warps to wefts per square inch, range from such extremes as 87:39, 70:24, making a "warp-face" fabric, to lower ratios of 50:38, 46:34, close enough to "square count" to be so classed. Nevertheless, the general tendency is toward a heavier proportion of warps to wefts, so that fifteen of the nineteen belts are warp-face fabrics, the four others approaching square count being the aberrations. Warp-face textiles are favored as belts in most weaving cultures because of their longitudinal strength. The weave lends itself to stripe decoration. Once the colored elements have been placed in their proper position in the warps, the weaver need not change weft color (since the wefts are obscured by the warps) and an attractive cloth results with a minimum of effort.

Ingenuity in arranging stripes of pleasing and diverse color is notable in the Class A Kusaien belts. The warp stripe patterns are remarkably similar in their general visual effect, yet variations in color sequence provide each piece with individuality. All color stripes are narrow; that is, only a few warps in width: no broad or bold banding effects are manifest. In all cases there is a background color: seventeen of these are the natural fiber, two a somber blackish brown, against which the several linear colors are grouped. The stripe groups often consist of threes, e.g., purple, orange, purple (11-189), and frequently alternate across the width of the fabric with a second grouping, e.g., rust, green rust, alternating with brown, yellow, red, yellow, brown (11-191). Thus variation is obtained in color by choice for the stripe units and their alternates, in a slight change in scale for individual stripe widths, and changes of scale for the alternate units. The background color also may come into play in these space-scale changes, as a narrow spacing between color stripes causes the background to appear as a "working" color in the total composition of the fabric. A belt (11-193) which uses only blue for its stripes gains interest through these regularized changes in its stripe groupings and their relative scale.

The colors which appear in the nineteen Class A belts are given here in the order of preference, with the number of occurrences in parenthesis: red (11),

green (8), purple (7), orange (6), yellow (6), brown (6), blue (4), rust (2), white (1). The number of colors used in combination (against the backgrounds) are as follows: single units without alternates, 1 color, once; 2 colors, 6 times; 3 colors, 6 times; 4 colors, once. Color units in alternation: 1 and 3, once; 1 and 4, once; 2 and 3, once; 3 and 3, once. All striped units are arranged in color and spatial bisymmetry. Thus even the use of four colors may be extended into a wider group effect by a placement such as: green, yellow, brown, natural, brown, yellow, green, alternating with natural, brown, yellow, brown, natural, against a brown background (11-199). Other examples of such arrangements are of two or three colors, such as: rust, green, rust, natural, rust, green, rust, natural, alternating with brown, yellow, red, yellow, brown, against a natural background (11-191). Examples of color-space groupings are shown in Figure 3c.

Weft yarns are of natural, undyed fiber except in two with predominantly dark brown warps; these have matching brown weft.

Selvages, while having no special treatment in the way of extra warps, thicker warps, or of warp grouping in the return passage of the weft, are usually distinguished by color. In the nineteen belts at hand, fourteen have the edging warps in color; ten of these are red, with red especially placed there regardless of whether red is part of the color stripe groups or not. Other selvages colors are brown, green, or purple, placed there under the same conditions as red with regard to the total color scheme of the interior stripes.

Class B: Warp-Knotted Design Belts.[23] This class of belts is distinguished by several major and minor features. The overall designing is an arrangement of band-like sections across the width of the textile, though like all others, the composition is transversely bi-symmetrical. The number of bands is usually six though reduction to five occurs occasionally.[24] Within each section is a different pattern scheme accomplished primarily by color changes knotted in the warps or, secondarily, by changes of structural technique from plain weave to brocade or pattern weave. The fringe participates as one of the bands by always being of a distinctive color: rust red. Background color of all Class B belts is

23 Five examples: Museum of Anthropology, University of California, specimen numbers 11-182, 11-183, 11-185, 11-188, 11-567. One fragmentary specimen in the museum (11-567a) and one owned by Gayton have been taken into account, but not analyzed. Illustrations of Kusaie belts appear in Christian, 1899, p. 394, p. 397, and Sarfert, 1919, pls. 14 (1), 15 (2, 4), 26, 28-34. The Kusaie belts with warp-knotted designs are divided by A. Krämer into five sub-types according to variations in internal composition (in Sarfert, 1919, pp. 188-191, fig. 106, pls. 29-34). Our five specimens are all of the kïël sub-type, as are the two additional ones.

24 Seemingly a standard variation, since design section B is the one omitted in three examples: 11-183, 11-567a, and one in Sarfert, 1919, pl. 32 (16).

"black," or a deep brownish black approximating true black: the tone variation is slight. Size and proportions on the whole differ but little from the Class A belts, and like Class A, the belts with warp-knotted designs follow a closely standardized style while retaining individuality in minor color and scale changes.

A graphic description of the composition, nature of design units, and warp-knotting method is given in Figures 2, center, and 3d, based on specimen 11-188, which is exemplary of its type of Micronesian textile.

The layout of composition in this specimen is with the standard six bands: A1, A2, the red fringe (cut in halves); B, the tripartite band of symmetrically staggered rectangular units of black, white, brown, yellow; C, the warp base, yellow, brocaded in rust; D, a band of rectangular units, black, white, brown, yellow; E, the extenders of black, white, yellow, purple, into the black field of the major portion of the belt; and F, the striped section in black, white, red, yellow, purple. The segments of color in the designs are all rectilinear in form. Some are obviously so; others, because of their extreme narrowness and elongation, are not immediately recognizable as such.

The fine scale of the fiber yarn composing this belt (and others of its class) makes it appear as if the design bands crossing the fabric were constructed by knotting a new bit to each warp separately all across the belt. Such a method could be used regardless of whether the warp were of ring or open type and would simplify the designer's task from a visual point of view as she made the increments of warp on the frame posts. However, another method which obviates the necessity of so many knottings, but calls for greater imaginative preplanning and careful execution, was evidently preferred.

It so happens that in the various design bands or sections, segments, often minute, of the same color will recur one beyond another through two or more bands. Such color repetition may be but a few warp strands wide (Figure 3d). This conjunction or contiguity of a color, wherever the design units call for it, determines the method of knotting colors into the warps. The rule for warp construction, then, is this: that whenever a color is contiguous between design bands the knotted-in length of that color is sufficient to carry through the entire distance required, whether it be through two, three, or more bands. Simple as this may sound, in actuality the worker is dealing with constantly changing variables on every round of the warp as it is built up on the warping frame. The length of a color fiber to be knotted in may be exactly as it appears in the cross bands—a short unit. Or it may be an illusory length which because of the

break-up of the design appears to stop at a band edge but in actuality runs through several sections.

To aid in the task of measuring lengths of warp to be added, a grid resembling a small ladder laid on its edge is fastened into the warping bench. This tool does no more than offer the worker a means of keeping the section lines of the design bands even across the warps of the future fabric. That is, the division lines where knots may (but do not always) occur are at right angles to the selvage lines. By analogy: it is as if the grid shows the worker 1, 2, 3 or more inch lengths so that equivalent yarn additions will be exact in length, but does not show *when* a length should be 1, 2, or 3 or more inches.[25] The creator of the warp-knotted designs, with the total composition of the textile in mind, determines the increment of color needed. Because of the transverse bi-symmetry of the composition, all the creative work is done when the center warp is reached; thereafter she may copy in reverse what she has already constructed on the bench posts. The number of knots in a Class B belt are in the thousands: an estimate for type specimen 11-188 gives around 4000, i.e., 8 in each of the 498 warps.

As an example of the knotting method Section A2, B, C, and D are shown in Figures 2, center, and 3d. At the boundary between A2 and B there is a row of knots in each warp because the color rust red of the fringe does not occur in the next section (B). Section B is a tripartite pattern made up of staggered rectangles using the colors black, white, brown, yellow. The three subdivisions of B are called B1, B2, B3 herein. Section C is a band with all yellow warps (upon which a superstructural weft of rust will be brocaded at the time of weaving). Section D is a band of black, white, brown, yellow rectangles (short broad stripes), a single variation of the triple pattern in Section B.

Thus yellow appears in three sub-sections and two whole sections contiguous to each other. To create the yellow areas the following lengths of yarn are knotted in:

Beginning at the boundary A2:B, and in variable order according to the needs of the design, yellow yarns may extend from B to B1, from B to B2, from B1 to D, from B2 to D, from B2 to E, from B3 to D or E, from C to E.

Since warps of Section C are entirely yellow, any warp that was not already yellow at the boundary B3:C will be changed to yellow by knotting-in. If yellow

25 Krämer-Bannow shows five ways in which the weaver determines variable long lengths of yarn, but does not point out the subjective creative problem in selecting which to use (in Sarfert, 1919, p. 179). There are at least ten different yarn measurements used in the patterning of type specimen 11-188.

rectangles in Section D are in line with yellows in B3 or B2 and B3, they will have been carried through C as part of C's all yellow warp. Whenever a yellow rectangle in D has not been supplied by this means, its warp will begin at B3:C and run through to E.

In Section D, of course, black, white, and brown will have to be knotted in anew (because of the all yellow Section C). But black is the basic color for Section E (the major portion of the belt), so all black additions will run at least to Section F (boundary E:F) where the stripes begin. However, black is the background color between the stripes, and in such linear areas the black warps must be continued to A, where they will be terminated by knotting on rust yarns for Section A (fringe).

Turning now to Section F, we find stripes of black (the background), white, yellow, purple, and rust. Black is cared for as mentioned above. White, yellow, and purple are knotted to Section E black (boundary E:F) and extend just the length of F. Rust, however, occurs in the fringe, so that whenever this color is wanted as a stripe, it too is knotted onto black for Section F but will carry on through the fringe section A, to terminate at the beginning of Section B.

In the specimen described (and in most others of Class B) the only cross-line in the belt where knots occur in every neighboring warp at the same point is at the division between Sections A and B, i.e., the end of the all-rust fringe and the beginning of a new color scheme in which rust does not occur.

The Class B belts, like most warp-face fabrics, have a minimal treatment of the wefts; this element functions only mechanically as a transverse binder, not as a decorative ingredient. The material, size, and quality of the wefts are exactly like the warps. Color is considered because the ratio of warps to wefts, plus the slick surface of the yarn, permits the wefts to show slightly between the warps if closely inspected. The dominating color of these belts is black, and black weft is used throughout save in the brocaded sections. In specimen 11-188 Section C with its all yellow warps has a yellow weft, evidently for the purpose of making a clear bold yellow background for the rust red brocading yarn. The depth of Section C is five-eighths of an inch, which required only twelve shots of the yellow weft; for all other sections, regardless of their warp color schemes, black wefts suffice.

Boundaries between design sections of the belts are emphasized by the addition of what is technically a weft element. This consists of a slender bunch of black fiber yarn laid in the shed at the cross-line of color-change knots. The structural weft continues normally; the extra weft is clipped off at both selvages.

The result is a transverse welt or repp which defines the design division and at the same time tends to camouflage slight irregularities in the line of knots. Considering the fineness and contrariness of the warp fibers, the crudeness of the measuring apparatus, and the distorting mechanical stress caused by battening on a ring-warp, it is remarkable that the cross lines of knots concur with the weft welts as perfectly as they do. In specimen 11-188 the thick extra wefts occur between Sections A, B, C, D, and E, but not between E, F, and A.

In these belts with warp-knotted designs the short section of brocade is a distinct technical innovation. Frequently, but not always, the rarer and probably imported cotton yarn in blue or red is used for imbrication. Our type belt has rust red banana fiber yarn as the brocading weft, presumably representing an older usage. All brocade designs in Class B belts are quite simple, comparable to Section C in specimen 11-188 shown in Figure 2, center.[26] The brocading weft is superstructural, inserted to raise a pattern without regard to the basic weft which continues its normal function. The brocade weft in 11-188 is slightly heavier than the basic weft, consisting of four to eight filaments (depending upon their coarseness or fineness) to compose a constant yarn thickness. Start and finish of the extra weft is merely a clipped end. The technique is the simplest type of brocading: the ornamental weft caught under two warps at the selvage and, following the shed line (but not within the shed) of the basic weft, floats across the warps or under them, moving from front to back surface of the cloth at the designer's will. At the opposite edge it is caught under two warps, turns for the next shed, passes under two selvage warps and again moves across the remaining warps in a series of front or back floats. The basic yellow weft continues normally over and under each warp in its own shed. The over and under surface brocading floats create a geometric pattern (obverse and reverse) of simple but pleasing repetitive units. While the center point of the pattern roughly coincides with the longitudinal axis of the fabric, bi-symmetry is not the aim of the brocaded design section. In example 11-188 the units "point" one way all across the cloth; easily, they could have been reversed at the center line to create an opposed half had the weaver so desired. However, the nature of the units themselves and the smallness of the section in which they figure scarcely interrupt the lineal balance of the total composition of the belt.

The final design section (F) of the Class B belts consists of narrow stripes

26 Both A. Krämer and E. Krämer-Bannow refer to this technique as "wattle work" (Sarfert, 1919, pp. 184, 193), a curious term for the structure involved: a two-face brocading with *extra* weft. That this extra weft was not put in after weaving is clear from its physical relationship with the basic weft and the selvage warps. Illustrations of brocade designs are shown in Sarfert, 1919, pp. 192, 193.

compactly aligned and lineally balanced in color and scale. Here occur two very minor technical changes still dependent upon warps as the decorative factor. In specimen 11-188 the weaver has taken advantage of one of the simplest devices for design in warp stripes: the repeated alternation of two colored warps so that, when woven, one color is on the surface at one shed, the opposite color on the surface at the next shed. This results in narrow horizontal areas of color succeeding each other lengthwise of the web. Adroit use of this technique in small scale bands of natural and black, and yellow and black, intersected by fine stripes of rust alone and black alone, make interesting borders to Section F. They fill the two outer quarters. The contrasting inner half of Section F is composed of thin stripes of black, natural, yellow, and purple—some single, some paired, all compact.

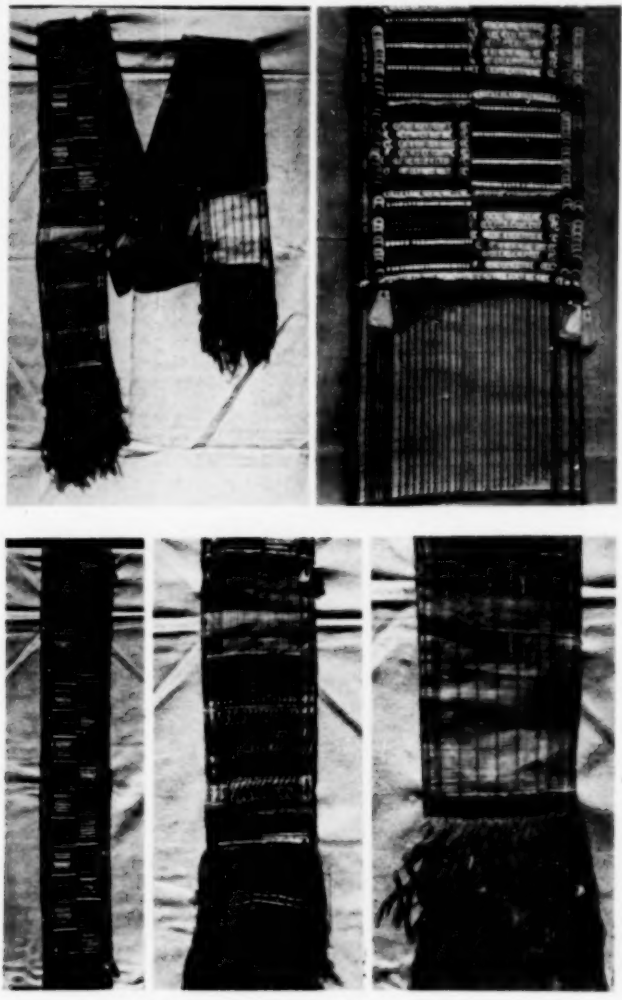
The other variant technique, in Section F of other belts—which are always closely striped in color—is that called pattern weave: occasional warps are floated regularly to create a surface design instead of being bound in by every weft shot. An example is specimen 11-185. In all cases the warp float patterns are uncomplicated, being little more than a single warp in width. The short floats appear regularly as glossy vertical "dash" lines on the otherwise closely woven web surface.

Class C: Bead Encrusted Belts.[27] The belt from Ponape is basically like Class B, described above, consisting of a ring warp, knotted-in warp patterns, brocaded section, and special-color fringe. (The additional red wool yarn fringe is but a super-interpretation of the standard fringe in Class B belts.) (See Plate 2.)

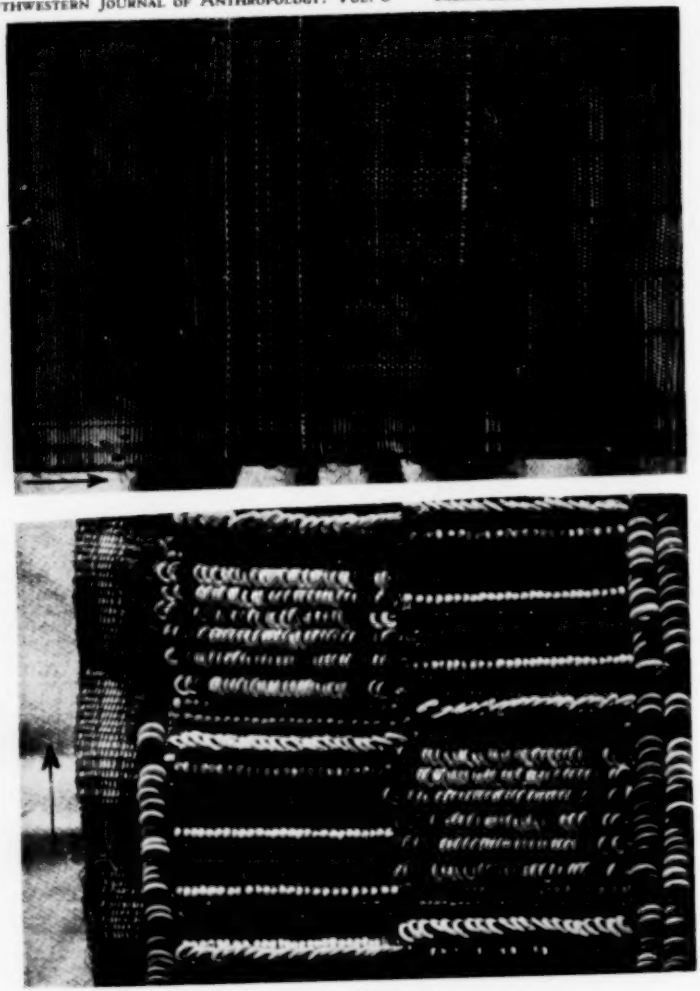
The individualistic feature of Class C is the ornamental patterning in beads which are in-woven as the work progresses, not applied after the web is finished. The extra wefts which carry the beads cause this portion of the belt to be put in the technical category of brocading. However, far more than simple insertion of a superstructural weft is involved, since not only are the bead ornaments to be carried on this weft and placed each in its exact position, but three more techniques are used to achieve the proper placement or "lay" of these items. Thus (1) the glass beads have one type of placement; (2) the shell beads overlap in shingled formation; and (3) vertical rows of shell beads stand on edge: the three variations occur side by side across horizontal units in the beaded section of the belt.

When this manipulative achievement is added to the already complex warp-

27 One example: owned by Saul Riesenberg (SR-Po). This is an heirloom belt known to have been made prior to 1870. Similar belts, some with more brocading and with more or less beading, are shown in Hambruch and Eilers, 1936, pp. 286-294, pl. 1 (1, 6).



BEAD ENCRUSTED BELT OF PONAPE, CLASS C



DETAILS OF CLASS C BELT

Top: Weft welts at end of Section E; knotted triangles in Section F.
Bottom: Bead imbrication (arrow indicates warp direction).

knotted patterning, it will be seen readily that the specialized textile art of Ponape is one of high virtuosity. There is little wonder that, having developed the skill necessary to produce such complex fabrics and arrived at a satisfactory formula for the handsome overlaid designs, there was little need aesthetically for the Ponapean weaver to experiment with other weaving methods.

On the island of Ponape brocading, whether beaded or not, has been elaborated as the major ornament on the fabric, overshadowing the knotted-in patterns by its boldness and complexity.[28]

Proportionate dimensions of Class C belts are longer and narrower than those of Classes A and B. The Ponapean belt (SR-Po) has a length (cut warp) of 70¼ inches with a width varying slightly between 4 and 4½ inches. The width is about one-seventeenth of the length.

Thread count of our specimen averages 57 warps to 29 wefts per square inch, clearly a warp-face ratio, but coarser than Kusaie Class B.

Warp and weft yarns are of banana fiber of like quality and size. Here, however, the size as compared to yarns in Class A and B belts is a heavier quality, being about equal to the coarsest yarn used in Class A. Tightness of weave seems constant in all belts handled, so is not a factor in the count.

Extraneous fibers in the Ponapean belt are a blue cotton and a yellow and a red wool, all used decoratively for brocading or fringing. (Hambruch and Eilers mention red, yellow, and blue wool as decorative yarns.)

The total composition of the belt adheres to the six section plan of Class B, but the sections differ markedly in interior scheme. The layout is shown in Figure 2, bottom: Section A1, A2, the warp fringes; Section B, brocade; Section C, warp stripes; Section D, bead encrustation; Section E, major plain area; Section F, warp knotted design.

The warping method is that described previously. Need for the grid warp-gauge is slight since the knotted-in designs are limited to stripes in Section C and graduated stripes in Section F. However, posts control the major change points between sections as in Class B construction. Only three colors—natural, rust, and black—are employed, which also lessens the task of intra-warp additions.

A major difference in overall planning for the Ponapean belt lies in a group of stripes which follow the selvage the full length of the warp. Beside their ornamental interest, they evidently serve the practical purpose of making a visible boundary for the added elements of brocade wefts and bead-carrying wefts. Only the red and blue wefts of brocade in Section B extend into the striped border, but not to the selvage.

28 See Hambruch and Eilers, 1936, *loc. cit.*

Because these outer stripes extend the full length of the textile, the standard rust-colored warps for the fringe (Section A) are set within this frame: as usual, the color change requires that they be knotted-in. In spite of the care taken to adhere to the traditional fringe color, these warp fringes are eventually totally obscured by the bright red fringe of wool set over them.

The knotted-in designs of Sections C and F may be described briefly. The stripes of Section C are black, natural, and rust (Plate 2, upper right) and are achieved by the usual means of a continuum if one color aligns in two or more adjacent design areas. Thus, natural stripes are a continuation from neighboring all-natural Section B; rust stripes, newly added for Section C travel beyond its boundary into the all-rust Sections D-E. This leaves black as the only stripe or warp color to be knotted-in for just the length of this three-color striped area.

Section F is more complex in design: a thinly striped rectangle of natural color with six triangular extensions on one end is set into a larger rectangle of solid rust which is bounded by the selvage stripes on each side and the usual cross welt at each end boundary (Plate 3, top). In the natural rectangle five thin stripes of rust and black divide it lengthwise into six broad bands which terminate in triangular forms made by continuing some of the natural warps into the rust background. The following knotted-in variables occur. Rust warps may (1) terminate at the tips of the triangular extensions, (2) continue to the base of the triangles between the extensions, or (3) continue—as in the thin stripes—through the natural rectangle to become warps in the rust fringe (Section A). The natural warps may be either the length of the rectangle they fill or may extend as lines to make the triangles: none extend beyond the boundaries of Section F. Black warp segments, used sparingly as accent, are knotted-in for just the length of the natural rectangle which they stripe.

The natural warp extensions comprising the triangles should number seven to a triangle: some discrepancy occurs both in their number and their lengths. The base line of the triangles should move straight across the web; this is indicated by a weft welting inserted, as usual, where knots abound in a horizontal line. How far this knot line missed position is clear in Plate 3, top, and the irregularity seems due to inaccurate measuring of the extenders. That is, the tips of the triangles are fairly well aligned, their bases are not.

Brocading with yarn has three major forms in this Ponapean belt: (1) the patterning of Section B, (2) the delimiting of section boundaries, and (3) the adding of red wool as pile and fringe. In the first case the brocading method is that used in Class B belts: blue cotton and red wool alternate pleasingly as bands of small simple geometric figures within the side boundaries of the selvage stripes.

Each band is separated by two weft shots of blue in an over-three, under-one shed which run to the same side limits. The brocading wefts of the patterned bands, however, float on the back of the web to emerge and cross the rust lines of the selvage stripes before returning for the next shot. These surface floats form narrow blocks of red and blue paralleling the patterned area (Plate 2, bottom center).

The divisional welts of brocade are expanded into a cluster of cross lines in the Ponapean belt. Where a section line coincides with a line of knots the introduced welt weft is of brown banana fiber. The additional decorative cross lines of brocade, all in an over-three, under-one shed, are of red wool, yellow wool, blue cotton, natural and brown banana fiber. Color preferences for these are: red used 17 times, blue 13, natural 7, yellow 6, and brown 2. These clusters of colored rows are a distinctive, finely-made detail of this belt.

The red wool used for pile and fringe is inserted under the warps as a superstructural yarn; i.e., the basic weft continues in the same shed. Closely packed loops of the wool—long or short as needed—have been drawn under a few warps at a time leaving the ends to hang out. The lines of pile at section divisions A2:B and C:D are roughly trimmed to about a quarter-inch depth. The resulting bright thick crest of fuzz contrasts sharply with the flat fine-textured fabric. Wool fringe ends hang in long loops covering the under fringe of rust fiber warps. Bead work embellishes the wool over-fringe in half A2.[29] Strictly speaking, these wool additions are not brocade, but the technique allies more with the brocading method used elsewhere in the belt than with any true pile technique which involves knots or twists.[30]

The bead encrustation which gives the handsome character to the Ponapean belt is a work of artistic skill. Alternate blocks of shell disc rings and of trade beads fill Section D, while rows of the shell discs parallel its boundaries along the selvage stripes (Plate 3, bottom). The shell provides three colors—a creamy white, a pale yellowish pink, and a smoky black: all are used with deliberate effect. The glass beads of a dark brownish red and strong deep yellow pick up the major hues of the rust and natural fibers of the fabric. Black and white beads produce a heavy accent, and a limited introduction of lambent blue beading brings piquancy to the total color scheme.

Not only have the bead colors been distributed in fullest effect; bead contour has been played up as well through manipulative technique (Plate 3, bottom). The glass beads are small, spherical, and lie almost embedded in the fabric as flat,

29 Hambruch and Eilers (1936, fig. 70) show one fringe with a similar cross-binder.

30 Such as the familiar Ghiordes or Senna rug piles.

strongly striped areas. The complementing areas are of white shell discs arranged as a shingled surface. Between each of the block areas there rises a crest-line of shell discs set on edge which accentuate the three-dimensional quality of the whole beaded section. The combination of color and texture is superlative: no more masterful use of the materials could have been made by the most sophisticated designer.

As to workmanship, the weaver's patience and skill have been aimed toward perfect production. The application of the superstructural ornament is basically a brocading technique, but to attain the three types of surface-contouring four methods of imbrication necessarily occur along the same shed-line on each ornamental row. These methods are shown in Figure 3e and display the arrangements more lucidly than a prolonged verbal analysis.

In brief, the methods are these. The rows of glass beads are carried on a sustaining weft which may be continued through several rows regardless of color change. This dark grayish weft passes under every fourth warp between which a bead is located. (At all times the basic rust weft of the fabric continues in its normal over-one, under-one shed.) (Figure 3, e1.)

The shell disc rings which are shingled are retained in position by three strands. One is the sustaining weft carrying the discs and running under every fourth warp. The other two, as an opposing pair, cross under the lower edge of a disc, then pass over the sustaining warp, and turn downward to cross under the next disc. The spiral lashing action of these taut binders forces the discs sideways into an overlapping position. (Figure 3, e2.)

In the vertical ridges, each shell disc retains its place by being raised on a lashing strand which passes through the ring and takes one or more turns on itself to form a short wrapped "stem." This strand then passes under a raised warp and under a sustaining weft which, like the others, lies below every fourth warp. The discs stand erect, overlapping diagonally. (Figure 3, e3.)

The long rows of shingled discs which parallel the beaded Section D are held there by lashing strands which travel along the warps. A pair of fiber yarns carries the shell rings and by an opposed spiraling progression move through the center of a disc and under a surface warp repeatedly. Here again, tension on the lashings forces the discs to flatten down over each other.[31] (Figure 3, e4.)

31 Throughout Section D the bead encrustation is so tightly applied that it is extremely difficult to analyse the foundation which it obscures. We are indebted to J. W. Baughman for checking and corroborating our findings.

CONCLUSION

From the evidence presented it seems clear that the spread of weaving into Oceania was from Indonesia into the Caroline Islands and thence into Melanesia. That this was not a simple process is equally evident, diffusion in various directions causing considerable complication. We may suppose that ring-warp weaving was introduced from Indonesia into the Western Carolines first, that it by-passed Palau and spread eastwards. The loom with cylindrical beams diffused to the end of the Caroline chain. Later, open-warp weaving was introduced on Yap, but did not pass beyond this northwesterly Caroline island. The board shaped beam spread independently and later into the Carolines, replacing the round beam in most islands, existing side by side with it in some of the eastern islands, changing to the form square in cross-section in some of the central islands. Meanwhile the older, cylindrical beam spread south, probably via Kapingamarangi, into Melanesia. The square beam of the central islands also diffused south, again via Kapingamarangi, so that both round and square beams are found in Melanesia today. The board-shaped beam failed to reach Melanesia except for the single occurrence at St. Matthias, which must represent a separate introduction.

The pair of laths for the lease occurs in the Carolines only in the eastern islands and some of the central islands; it seems to be the older form, co-existing with the later, single lease rod in those islands, and replaced entirely by it in the west. Since the paired-lath lease is the only form in most of Melanesia, it presumably spread south, possibly accompanying the round and square beams, before the single lease rod entered the Carolines from Indonesia. Again the path of diffusion leads via Kapingamarangi. The occurrence of the newer form at Takar-Saar and St. Matthias suggests a second, separate introduction of weaving to these areas.

Since the two-edged sword (batten) is in Micronesia almost confined to the eastern half of the Carolines, we may look to that area for the source of the trait in Melanesia, where it is the only form known. Details in resemblance once more point to Kapingamarangi as the intermediate source. The two-edged sword seems once to have extended through the Pacific weaving area, but has been replaced in the west by the later single-edged type, which today is almost exclusive in Indonesia. It has survived in the west only on Sonsorol.

The open-bodied bobbin, though sporadic in distribution, again leads us from the Central Carolines, via Nukuoro and Kapingamarangi, into Melanesia. Probably it is of local origin in the Central Carolines.

The warping bench leads from the Eastern Carolines, via Kapingamarangi, to St. Matthias: the associated measuring grid, invented in Ponape or Kusaie, did not diffuse with it. The occurrence of warping frames in Indonesia may indicate a former continuous distribution with subsequent loss in the intervening area where they are absent today. But since there is no trace of them on any island in the western and central groups, independent invention on Kusaie or Ponape is not improbable.

The knotting-in of designs of the Eastern Carolines apparently has a relationship with the very elementary method of Lukunor and Namoluk. Whether the simpler form represents that from which Kusaie and Ponape weaves have sprung, or whether it is a degeneration of the more elaborate technique of the latter islands cannot, of course, be definitely ascertained. The method and the geographic continuity, however, clearly indicate a genetic relationship.

Absence of warp-striping ties the Melanesian area to either the Southwestern Carolines or to the two central islands of Namonuito and Puluwat, with Kapingamarangi and Nukuoro furnishing a link in the latter case. The presence of striping at Takar-Saar and St. Matthias indicates a separate influence in these islands. Similarly, absence of pattern weaving reveals a relationship of Nukuoro and Kapingamarangi to Melanesia, and absence of brocading ties Kapingamarangi to all of Melanesia.

Narrow fabrics for men's use are characteristic of Kusaie and Ponape in the east, also in the Southwestern Carolines, while elsewhere in the Carolines woven fabrics for both sexes are wide. Men's breechclouts are narrow also on Nukuoro and in the Melanesian weaving area. The direction of diffusion would seem to lead from the Eastern Carolines to Melanesia via Nukuoro. (Kapingamarangi is not involved, since there the breechclouts were of barkcloth.) The southwestern islands are doubtless too remote geographically to affect the picture directly, which is also true in the case of stripeless weaving.

Masculine weaving appears to be independent in origin on Kapingamarangi and to have spread thence to Melanesia; the exceptions in Sikayana and St. Matthias suggest additional influences here from elsewhere in the Carolines.

The bond between Micronesian and Melanesian weaving is demonstrated in the following reconstruction of their affinities:

Cylindrical beams: Lukunor, Ponape, Kusaie; to Nukuoro and Kapingamarangi; to the Polynesian outliers in Melanesia; to Santa Cruz and Banks. Kapingamarangi to St. Matthias (and Takar-Saar?).

Square beams: Namonuito, Pulusuk, Truk, Lukunor; to Nukuoro and Kapingamarangi; to the Polynesian outliers.

Board beams: Carolines generally to St. Matthias.
Paired-lath lease rod: to Central and Eastern Carolines; to Kapingamarangi; to outliers; to Santa Cruz and Banks.
Single lease rod: Carolines generally (or Indonesia?) to Takar-Saar and St. Matthias.
Double-edged sword: Carolines east of Pulusuk-Puluwat; to Nukuoro; to Kapingamarangi; to Melanesia. *Double-edged sword with one point:* Lukunor and Kapingamarangi to Melanesia. *Keel-ridge:* Lukunor; to Nukuoro; to Kapingamarangi; to Santa Cruz and Banks.
Open-bodied bobbin: Pulusuk; to Nukuoro; to Kapingamarangi; to Sikayana; to Santa Cruz.
Warping bench: Ponape and Kusaie; to Kapingamarangi; to St. Matthias.
Warp-striping: Carolines generally (or Indonesia?) to Takar-Saar and St. Matthias; degenerate form at Sikayana.
Absence of warp-striping: Puluwat and Namonuito; Nukuoro; Kapingamarangi; Melanesia.
Absence of pattern weaving: Nukuoro; to Kapingamarangi; to Melanesia.
Absence of brocade: Namonuito, Pulusuk; Kapingamarangi; Melanesia.
Narrow men's garments: Kusaie and Ponape; to Nukuoro; to outliers; to Santa Cruz. Nukuoro to St. Matthias.
Wide sarongs: Kapingamarangi or elsewhere in Carolines; to outliers; also to St. Matthias.
Feminine weaving: Carolines generally to Sikayana and St. Matthias.
Masculine weaving: Kapingamarangi; to Polynesian outliers (except Sikayana); to Santa Cruz.

Kusaie and Ponape thus are involved, apparently, in the diffusion to Melanesia of cylindrical beams, use of paired laths for lease rods, double-edged sword, warping bench, and narrow men's cloths. In addition they possess, among other traits which did not spread to Melanesia, the knotting-in technique and, in Ponape, ornamentation with shell beads; the former occurs in much simpler form a Lukunor, Satawan, and Namoluk, the latter at Truk. Here the knotting-in technique may be interpreted either as incompletely diffused elements or as original forms from which the Ponape-Kusaie developments sprang. The Central Carolines, particularly Pulusuk and Lukunor, may likewise be involved in the diffusion to Melanesia of some of the above elements (cylindrical beams, paired lease rod, double-edged sword) as well as square beams, open-bodied bobbin, and the loss of warp striping. Separate diffusions which did not come via Kapingamarangi may account for the presence on St. Matthias of the single

lease rod, warp-striping, and feminine weaving; and on Sikayana of a form of warp-striping and of feminine weaving. Of these traits, feminine weaving may have reached St. Matthias and Sikayana via Nukuoro without involving Kapingamarangi. Board beams reached St. Matthias, possibly, through Kapingamarangi, but in a separate diffusion that did not affect the rest of Melanesia. It is possible that many of these distributions represent cases of discontinuities caused by persistence in marginal areas with abandonment in intervening areas. Weaving in the Takar-Saar area of New Guinea seems to be of direct Indonesian origin instead of coming via the Carolines. Geography suggests this, as well as the presence of such Indonesian traits as stick-shaped bobbins (also present on St. Matthias) and the use of cotton instead of the prevalent banana or hibiscus fibers. Both of these are absent in the rest of Oceania. St. Matthias also is unique in using pandanus for loom weaving.

A consideration of weaving methods and materials leads us to an hypothesis concerning the development of the specialized textile art of the Eastern Carolines —Kusaie and Ponape.

The ring method of warping is general over the Indonesian-Micronesian-Melanesian weaving area. Likewise the manufacture of yarn by knotting the banana fibers together is common, often the only method, wherever plantain or other long-staple fibers are used. Warp-face weave seems to be the traditional structural technique: it is an elementary technique ubiquitous amongst primitive weavers. However, if color is to be entered, this must be done either in the warps, or with surface brocading, since the wefts are obscured by the warp elements. When using the ring warping method (a continuous spiral of yarn), a new colored warp can only be obtained by tying or knotting it in at the proper points. To a weaver already working with yarns built by knotting this should have been an easy step, and may have been made independently in some of the weaving islands now having striped fabrics. Development of stripe designing with the finesse of the Kusaie belts calls for imagination and skill: the planned effect must be carried out during the warping process and, once done, cannot be changed.

Another stage in warp designing, making use of the knotting-in method, is to enter colors which do not run the entire length of a single warp circuit. Simple effects of this sort appear in the fabrics of Lukunor, Satawan, and Namoluk, and presumably were once used by weavers of Kusaie and Ponape before they moved on to their extreme elaboration of this designing method.

On Kusaie and Ponape—not content with the complex broken blocks, stripes,

and fringes, evolved from knotting in multitudinous short lengths of color—the weavers made use of the only other ways of obtaining ornament on a warp face web: floated warps (pattern weave) and brocading. Both these techniques are used tentatively on Kusaie without the mastery manifest in the knotted-in designs. Pattern weaving has a wider distribution in the Carolines, but on Ponape and Kusaie remains undeveloped in its design possibilities. The vigorous knotted designs of Kusaie and brocade motifs of Ponape may have held warp-float patterning in abeyance on these islands.

On Ponape alone the possibility of using a superstructural (brocading) yarn to carry bead ornament was envisaged. While brocading alone is more highly developed here than on Kusaie, it must be pointed out that the brocading yarn carrying the beads is not ornamental in that circumstance, but a functional element. The basic technique, however, is ideationally the same.

In sum, it is our belief that the elaborate elegantly designed fabrics of Kusaie and Ponape are the florescence of locally known techniques: they result from an internal sequential development. The possibilities for such development are inherent in the basic elements common to the Micronesian-Melanesian weaving area, namely, the knotted yarn, the ring warp, and the warp-face weave.

We are interested in putting forward this theory of local development because the superficial resemblance of Kusaie-Ponape knotted designs to ikat (resist-dyed) textiles has been the basis for two other theories of their origin. The first of these holds that knotted-in warp designing was once more general in the Indonesian-Micronesian contact area and that the Micronesian technique was the inspiration for ikat designing now prevalent over most of Indonesia, but where knotting-in is unknown. That is, the idea of dyeing a warp yarn length in two or more colors was substituted for tying in various colors.[32] The second theory is the reverse: that Caroline knotted designs resulted from an attempt to duplicate resist-dyed fabrics of Indonesian source. Both theories have been repeated by several writers.[33]

The first theory is, of course, concerned rather with the origin of ikat technique, not the knotted-in method of designing. There is no occurrence of knotted designs outside the Caroline Islands known to the authors. At least some survival of the method would be expectable had it ever been general in Indonesia. Moreover, that ikat should have originated in warp-knotting seems improbable in the

32 Linton, 1926, p. 53.

33 Nevermann, 1938, p. 117 (an inclusive reference). Christian likened Kusaie fabrics to ancient Japanese *basho-fu* cloth but did not specify any resemblance beyond the fiber material (Christian, 1899, pp. 394, 397).

light of the extreme antiquity of ikat in India as clearly shown in the Ajanta Cave paintings.[34]

That warp-knotted designs should have resulted from contact with ikat patterned fabrics seems implausible for reasons over and above those which logically indicate an internal development. Resist-dyeing techniques are unreported from Micronesia; the nearest source of ikat fabrics would be the Philippines or Celebes.[35] Dyers and weavers of such skill as the eastern Carolinians would immediately recognize any ikat fabric which came to their hands for what it was—composed of yarns sectionally dyed—and easily enough have devised a method of duplication. Besides, any hypothetical ikat fabric which might have reached Kusaie-Ponape would have been in but two or at best three colors. Kusaie belts employ five colors. Neither the design motifs nor total composition of the Kusaie-Ponapean belts bears any resemblance to the ikat fabrics of nearest possible Indonesian sources, e.g., Borneo, Celebes, Philippines.

Shell discs and the substituting or augmenting European beads are common enough sewn, strung, lashed, or glued to various types of objects including textiles, in the general Indonesian-Micronesian-Melanesian island area. But the Ponapean method of imbrication relates to their weaving method, brocade; the product seems wholly aboriginal in design and technique. Embellishment with either the glass beads or ravelled wool are contact indicators only and imply nothing more than an addition of new and interesting materials in a manner already established in native practice.

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34 Iklé, 1931, pp. 3, 5, 46, fn. 27.

35 Bühler's study of resist-dye techniques, their classification and distribution, clearly shows the absence of these methods in Micronesia. Resist-dyeing, which does occur in Melanesia, is not associated with loom-made fabrics (Bühler, 1946, pp. 322-327, 332-336).

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